CONNECTICUT RIVER FLOOD CONTROL PROJECT

CHICOPEE, MASS.

CONNECTICUT RIVER, MASSACHUSETTS

ANALYSIS OF DESIGN
FOR
CALL STREET PUMPING STATION

ITEM C.5d - CONTRACT

MAY 1940

CORPS OF ENGINEERS, U.S. ARMY

U.S. ENGINEER OFFICE, PROVIDENCE, R. I.

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TABLE OF CONTENTS

I. INTRODUCTION

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A. AUTHORIZATION. - The Call Street Pumping Station is a part of the local protection works for the City of Chicopee. The Chicopee Dike is a part of the Connecticut River flood control plan included in the Comprehensive Plan of Flood Control for the Connecticut River as described in House Document No. 455, 75th Congress, 2d Session, and authorized under the Flood Control Act approved June 28, 1938.

B. NECESSITY FOR THE STATION. - As a part of the flood protection works from the Willimansett Section of Chicopee to the Chicopee River, a pumping station in the dike is necessary to discharge the effluent of the Call Street sewer into the river during periods of high water to prevent the flooding of cellars and low areas behind the dike. Approximately 740 acres are drained by the existing 54" x 60" egg-shaped brick sewer with the outfall into the Connecticut River at the site of the station. During periods of normal river stage, the effluent will flow to the river by gravity. Pumping will be necessary when the Connecticut River stage exceeds Elevation 53.5 mean sea level datum.

C. CONSULTATION WITH THE CITY OF CHICOPEE. - Preliminary to and during the actual design of the pumping station, consultations were held with officials representing the City of Chicopee. These latter include the Mayor, the City Engineer, the head of the Sewer Department and others. The pumping station design,as finally developed, meets with the approval in its essentials, of the City of Chicopee.

D. SHORT DESCRIPTION OF THE STATION. - The building which will house the pumps and other equipment will consist of a reinforced concrete substructure and a one story superstructure, of structural steel and brick, with glass block panels to serve as windows. The concrete roof slab will be covered with a built-up type roof of four-ply asphalt and gravel. The engine room on the ground floor will contain three gasoline engines and right angle gear units for the 36-inch pumps, the electric motor for the 16-inch pump, the standby unit, the overhead crane and other equipment. The substructure will be divided into wet and dry pump rooms by a reinforced concrete partition. The wet pump room will contain three 36-inch propeller type pumps and a sump pump. The gravity flow conduit will pass through the dry pump room and serve as a suction chamber for the 16-inch volute pump. The hoist for the backwater gate and the heating equipment will be located on an intermediate floor over the dry pump room which will also provide access to the intake structure. The intake structure will contain the racks and a gate to keep the wet well dry during periods of low flow and when no pumping is required. A grouted riprap channel will be provided for the discharge of the 36-inch pumps. A new concrete discharge conduit is provided from the pumping station to the river for gravity flow and the 16-inch pump.

II. SELECTION OF THE SITE

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The Call Street Pumping Station will be located in the recently constructed Chicopee Dike near the discharge end of the Call Street sewer. This location was chosen for the following principal reasons: first, the existing sewer discharges at this point; second, it was found not economically feasible to divert the sewer to a pumping station location at any other point; and third, foundation conditions were found to be satisfactory.

III. SOIL INVESTIGATIONS

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Foundation conditions were determined mainly by a 2-1/2" boring. In addition, three foundation auger borings were explored on the river bank. Locations of these borings are shown on Plate No. 9. Generalized foundation conditions are shown on Plate No. 10 as a profile along the center line of a sewer outlet of the station. Class numbers for types of material indicated in this profile are those of the Providence Soil Classification shown graphically on Plate No. 11 and described in Table No. 1. The foundation consists of lenses of medium to fine sands overlying an interstratified deposit of moderately compressible silt, fine sand and clay.

The proposed pumping station is located across an existing low earth dike with the bottom of the foundation mat about 40 feet above the deposit of interstratified silt. In view of the 40 feet of sand between the foundation and the silt deposit and the fact that the station weighs less than the material excavated, no settlement is anticipated.

Since the dike is very low the head is insufficient to create a seepage problem.

TABLE NO. 1

PROVIDENCE SOIL CLASSIFICATION
U. S. ENGINEER OFFICE
PROVIDENCE, R. I.

CLASS	DESCRIPTION OF MATERIAL
1	Graded from Gravel to Coarse Sand. - Contains little medium sand.
2	Coarse to Medium Sand. - Contains little gravel and fine sand.
3	Graded from Gravel to Medium Sand. - Contains little fine sand.
4	Medium to Fine Sand. - Contains little coarse sand and coarse silt.
5	Graded from Gravel to Fine Sand. - Contains little coarse silt.
6	Fine Sand to Coarse Silt. - Contains little medium sand and medium silt.
7	Graded from Gravel to Coarse Silt. - Contains little medium silt.
8	Coarse to Medium Silt. - Contains little fine sand and fine silt.
9	Graded from Gravel to Medium Silt. - Contains little fine silt.
10	Medium to Fine Silt. - Contains little coarse silt and coarse clay. Possesses behavior characteristics of silt.
10C	Medium Silt to Coarse Clay. - Contains little coarse silt and medium clay. Possesses behavior characteristics of clay.
11	Graded from Gravel or Coarse Sand to Fine Silt. - Contains little coarse clay.
12	Fine Silt to Clay. - Contains little medium silt and fine clay (colloids). Possesses behavior characteristics of silt.
12C	Clay. - Contains little silt. Possesses behavior characteristics of clay.
13	Graded from Coarse Sand to Clay. - Contains little fine clay (colloids). Possesses behavior characteristics of silt.
13C	Clay. - Graded from sand to fine clay (colloids). Possesses behavior characteristics of clay.

IV. HYDROLOGY

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A. DRAINAGE AREA CHARACTERISTICS. - The drainage area of 740 acres, as shown on Plate 1, consists, at the present time, of approximately 20 acres of fully developed commercial and industrial area, 230 acres of fully developed residential area and 490 acres of partially developed residential and undeveloped areas. Topographically, the drainage area is divided into two parts; a lower part located in the present flood plain of the Connecticut River in which most of the area is about Elevation 70, and an upper part consisting of a bluff which parallels the river including a steep face, several draws, and a flat top. It has been determined from the sewer map of the City of Chicopee that approximately 50 percent of the drainage area is, or can be, served by the existing combined sewer system. There are three outfall sewers which serve the drainage area; namely, a 54" x 60" egg-shaped brick on Call Street, a 15" circular on Forrest Street, and an 18" circular sewer on St. Louis Street. The total normal capacity (without surcharge) of these three outfall sewers is approximately 150 c.f.s., the Call Street Sewer having a capacity of nearly 140 c.f.s. Small future extensions of the sewer system are probable but major increases in the outfall capacities are unlikely in the near future.

B. RAINFALL RECORDS. - The following table derived from data presented in Misc. Pub. #204 U.S.D.A., "Rainfall Intensity-Frequency Data" by D. L. Yarnell, presents the best available analysis of rainfall rates for different frequencies and durations to be expected at Chicopee, Massachusetts:

MAXIMUM AVERAGE HOURLY RAINFALL RATES AT CHICOPEE, MASSACHUSETTS

Frequency Years	Duration of storm in minutes			
	30	60	120	240
2	1.96	1.16	0.65	0.50
5	2.50	1.60	0.92	0.62
10	3.00	1.85	1.12	0.75
25	3.90	2.42	1.46	0.94
50	4.10	2.70	1.70	1.06

C. DIKE SEEPAGE. - The seepage flow through the dike will be small and will not contribute significant quantities of flow to the total run-off.

D. RUN-OFF RECORDS. - Records of the type that would be useful in estimating the run-off from the drainage area at Chicopee are not available.

E. DESIGN RUN-OFF. - In computing the maximum rate of run-off, the average intensity of precipitation used was that for the two hours of most intense rainfall of a storm having a frequency of 10 years for the City of Chicopee, according to the Yarnell relations. The use of a 10-year 2-hour storm has been adopted as a standard for the most intense storm for which it is economically justifiable to provide pumping capacity even in highly developed urban areas. There is evidence that this standard is more severe than similar standards adopted by numerous principal cities for use in designing storm water drains.

Run-off coefficients are determined from consideration of the size, shape and slopes of the drainage area, the types of development, the existence and type of natural or constructed drainage courses and the surface and subsurface storage. All of these factors are weighed to give the adopted figure which is, in the final analysis, based upon judgment and experience. In general, the drainage area is divided into three types for both the present state of development and an estimated future state of development. The three types are fully developed industrial and commercial, fully developed residential, and partially developed residential.

In computing run-off the product of the rainfall intensity and the run-off coefficient is modified by introducing a multiplier which is called the relative-protection-factor. When providing protection from run-off for a composite area, it is not necessary to furnish the same degree of protection for a partially developed residential area as for a fully developed industrial area. Allowance for this fact is made by introducing the relative-protection-factor (R.P.F.) which is the index of the amount of protection from run-off which one area warrants relative to another. The relative-protection-factor is defined as the ratio of the intensity of precipitation used in computing the run-off from a given area to the intensity of precipitation of the basic design storm. In other words, the adopted basic rainfall intensity multiplied by the R.P.F. gives the rainfall intensity for which protection from run-off is provided. The R.P.F. is a function of the amount of local flooding of short duration, which can be tolerated on the different types of drainage area, and of the relative topographic positions, in the drainage area, of the divisions having different types and states of development. An R.P.F. of 1.0 was used for fully developed industrial and commercial areas, 0.8 for fully developed residential areas, and 0.6 for partially developed areas. A relative-protection-factor of 0.8 corresponds approximately to a 5-year storm as compared to 1.0 for 10-year storm and 0.6 corresponds approximately to a 2-year storm.

It may occur that a partially developed portion of the drainage area, or one fully developed that is not provided with a complete system of storm drains, is so topographically situated that lines of natural drainage will prevent local ponding, and will concentrate excess run-off in other areas where additional ponding cannot be tolerated. In such cases the relative-protection-factor cannot be considered as a function of type of development only, and it may be desirable in exceptional cases to increase the factor to more than 1.0.

The divisions of the drainage area, as described in Paragraph A, together with appropriate rainfall rates, run-off coefficients, and relative-protection-factors are presented in the table below. Type "A" areas are fully developed industrial and/or commercial, type "B" areas are fully developed residential, and type "C" areas are partially developed residential. Type "C_1" areas are partially developed residential areas having steep slopes and type "C_2" areas are partially developed residential areas having moderate slopes, both situated above fully developed portions of the drainage area. Owing to the small capacity of the existing sewer system, it was deemed unnecessary to consider other than the present state of development of the drainage area.

Part	Type	Area Acres	Rainfall Rate in./hr.	Run-off Coeff.	R.P.F.	Run-off c.f.s.
Lower	A	20	1.12	0.65	1.0	14.6
Lower	B	120	1.12	0.50	0.8	53.9
Lower	C	70	1.12	0.30	0.6	14.1
Upper	B	110	1.12	0.50	0.8	49.3
Upper	C	120	1.12	0.60	0.6	48.4
Upper	C	300	1.12	0.30	0.6	60.5
					Total	240 c.f.s.

The maximum dry weather flow was computed on the basis of the present state of development as follows:

Type	Area Acres	Maximum rate of flow	Maximum discharge c.f.s.
A	20	20,000 gallons per acre daily	0.62
B - 25 persons per acre	230	200 gallons per capita daily	1.78
C - 10 persons per acre	490	200 gallons per capita daily	1.52
Infiltration of ground water	740	1,000 gallons per acre daily	1.15
		Total	5.0 c.f.s.

V. REQUIRED DISCHARGE CAPACITY

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A. PUMP CAPACITY REQUIRED. - The pumps will be required to discharge storm flow or dry weather flow whenever backwater from the Connecticut River raises the hydraulic gradient in the outfall sewer feeding the pumping station above Elevation 55. After completion of the approved plan of 20 reservoirs, a peak stage of Elevation 55 m.s.l. will be equalled or exceeded probably on an average of once in four years. For the past 68 years the Connecticut River at Call Street has equalled or exceeded Elevation 55. for a period of approximately 4 days per average year as shown on the stage duration curve (Plate 8). The discharge values given in the table below are obtained from the studies explained under IV Hydrology.

Dry weather flow	5 c.f.s.
Maximum storm flow	240 c.f.s.
Top of dike	El. 74.8 m.s.l.
Connecticut River design flood stage	El. 69.8 m.s.l.
Normal intake water surface	El. 52.0 m.s.l.
Maximum intake water surface	El. 55.0 m.s.l.
Design maximum static head (69.8 - 55.0)	14.8 ft.
10-year peak stage on Connecticut River (after 20-reservoir plan)	El. 58.0 m.s.l.

The design pumping capacity, including flow from dike toe drains, is 240 c.f.s. at a static head of 14.8 feet (69.8 - 55.0).

B. INSTALLED PUMPING CAPACITY. - The installation will consist of three pumps having a capacity of 80 c.f.s. each and an additional small pump to take care of minor flows of sewage and small amounts of storm run-off. Since existing sewer facilities are not adequate to carry the run-off which could be expected from the drainage area in its present state of development, it is considered unnecessary to install pumping capacity in excess of 240 c.f.s. to provide a factor of safety for mechanical failure.

Since the elevation of the 36-inch pump discharge pipes is 69.0 which is 0.8 feet below the Connecticut River design flood stage, the pumping head and the pumping capacity will be practically constant at all river stages.

VI. MECHANICAL DESIGN

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A. PUMP DRIVE. - The Call Street Pumping Station is one of seven pumping stations to be constructed in Chicopee. Prior to the design of any of the stations an investigation was made of the available electric power supply with the view of employing electric motor drive for the pumps. The results of the investigation indicated that suitable power was available. However, the City of Chicopee was unable to come to an agreement with the power companies on the question of rates and eventually requested this office to provide gasoline engine drive. (See Analysis of Design Jones Ferry Pumping Station, Chicopee, Mass.)

The gasoline engines for the Call Street Pumping Station will be of the heavy-duty industrial type capable of continuously driving the pumps at their rated speed under any head condition developed. The engines will not use over 85 percent of their developed horsepower. They will be mounted on concrete bases and directly connected through flexible couplings to the right angle gear units.

B. PUMPS. - From the ultimate required pumping capacity of 240 c.f.s., as determined in Section V, it was determined that provisions should be made to install three pumps. To install a larger number of pumps would materially increase the cost of the station without resulting in any great advantage and a smaller number would seriously limit the operating flexibility and reliability of the station.

A study of equipment indicated that three 36-inch propeller type pumps would be required; each pump to have a capacity of 36,000 G.P.M., or 80 c.f.s., against a total head of 17 feet. In addition, one 16-inch mixed flow type of pump having a capacity of 6,800 G.P.M. against a total of 22 feet was provided to pump the dry weather flow and dike seepage at such periods when the river is at flood stage and no storm water is to be pumped from within the protected area.

C. RIGHT ANGLE GEAR UNITS. - The gear units will be of the self-contained type designed for transmitting the power from the horizontal engine shaft through a gear train to the vertical pump shaft. The units will be inclosed in a cast iron and structural steel housing and will have a service factor of not less than 1.25 times the maximum power required to drive the pumps under any condition of head.

D. STANDBY GENERATOR UNIT. - A gasoline engine-driven generator will be provided to furnish electric power in the event of failure of commercial power. The unit will have a normal full load capacity of 93.8 kva, which will be sufficient to start and run the 16-inch pump motor as well as maintain in operation the other electrical auxiliaries and the station lighting system.

E. CRANE. - A ten ton overhead crane will be installed in the engine room to facilitate the repairing of any item of equipment. The crane will be of standard construction and hand operated throughout.

F. SLUICE GATES. - A motor-operated sluice gate will be located at the entrance to the pump sump. This gate will normally be kept closed to prevent water from collecting in the sump. It will be opened at such periods when it is necessary to operate the storm water pumps. A second motor-operated sluice gate will be located in the gravity discharge conduit to prevent backflow during periods of high water. This gate will normally be kept open to permit water to flow by gravity to the river.

G. WATER SYSTEM. - The city water supply will be connected to the pumping station and the water used for cooling the gasoline engines and station service. In addition, the sump pump will be so connected that it can be employed to furnish engine-cooling water in times of emergency.

H. GASOLINE SYSTEM. - Gasoline will be stored in a 2,900 gallon tank buried in the ground adjacent to the pumping station. Each engine will be supplied through an individual line running directly to the tank. Drip pans will be provided on each engine and connected to a common header running back to the tank. All gasoline piping will be 3/4-inch I.D. copper tubing with flared joint connections. At such points where the gasoline lines are imbedded in concrete or pass through beams, they will be protected by wrought iron sleeves.

I. SUMP PUMP. - A motor-operated sump pump of 50 G.P.M. capacity will be provided in the wet sump for the purpose of drying it up after the pumping station has been in operation.

J. VALVES. - A flap valve will be installed at the end of each pump discharge line to facilitate the starting of the pump and to prevent back flow through it. Inasmuch as the pump discharge is approximately at maximum flood stage, no gate valves will be provided in the discharge line.

K. FIRE EXTINGUISHING SYSTEM. - A carbon dioxide fire extinguishing system will be installed and so arranged that any gasoline engine can be blanketed with gas by tripping a valve located just inside the main entrance to the building. Portable extinguishers will be provided to take care of any other emergencies.

L. HEATING SYSTEM. - The heating system will be of the two pipe gravity type consisting of an oil-fired boiler supplying steam to two unit heaters located at opposite ends of the engine room. The oil burner will be of the rotary type with electric ignition. The unit heaters will be of ample capacity to heat the engine room under the coldest weather condition.

M. SWITCHBOARD AND CONTROL EQUIPMENT. - The switchboard will be of the steel-enclosed, low-voltage, dead-front, light duty type with all controls mounted on the front. All circuit breakers will be manually operated. Circuit breakers for the generator and incoming feeder will be the airbreak type rated at 600 volts, 60 cycles, A.C., having an interrupting capacity of 20,000 amperes, provided with three instantaneous and time-delay magnetic overcurrent trips, and magnetic lockout attachments on each so that only one can be in the closed position at any time. This lockout feature will be provided to prevent the connection of the generator in parallel with the outside source.

All controls for operating the 16-inch pump motor will be located at the switchboard in order to centralize them with those of the outside source and standby generator. The external resistance of the rotor will be varied through a drum controller to provide speed regulation at one-half, three-quarters, and full load speeds. The speed reduction will be used to provide continuous operation during periods when the flow to the pump is less than full load capacity at rated speed. The secondary resistors will be mounted on the wall to allow free circulation of air for dissipating the heat generated. The primary of the pump motor will be controlled by a magnetic contactor, fed from the main bus through a feeder circuit breaker, interlocked with the "off" position of the drum controller so that the motor cannot be started without having all of the resistance in the rotor circuit at the time of starting. Feeder protective circuit breakers for the pumping station auxiliary equipment will be mounted on the switchboard, and each circuit breaker will be rated at 600 volts, 60 cycles, A.C., having an interrupting capacity of 10,000 amperes and provided with thermal and instantaneous magnetic trips.

VII. STRUCTURAL DESIGN

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A. SPECIFICATIONS FOR STRUCTURAL DESIGN.

1. General. - The structural design of the Call Street Pumping Station has been executed in general in accordance with standard practice. The specifications which follow cover the conditions affecting the design of the reinforced concrete and structural steel.

2. Unit weights. - The following unit weights for material were assumed in the design of the structure:

Water	62.5	pounds	per	cubic	foot
Dry earth	100	"	"	"	"
Saturated earth	125	"	"	"	"
Concrete	150	"	"	"	"

3. Earth pressures. - For computing earth pressure caused by dry earth Rankine's formula was used. For saturated soils an equivalent liquid pressure of 80 pounds per square foot per foot of depth was assumed.

4. Structural steel. - The design of structural steel was carried out in accordance with the standard specifications for Steel Construction for Buildings of the American Institute of Steel Construction.

5. Reinforced concrete. - In general, all reinforced concrete was designed in accordance with the "Joint Committee on Standard Specifications for Concrete and Reinforced Concrete" issued in January 1937.

a. Allowable working stress. - The allowable working stress in concrete used in the design of the pump house structure and conduits is based on a compressive strength of 3,000 pounds per square inch in 28 days.

b. Flexure (f_c). -	Lbs. per sq.in.
Extreme fibre stress in compression	800
Extreme fibre stress in compression adjacent to supports of continuous or fixed beams or rigid frames	900
c. Shear (v). -	
Beams with no web reinforcement and without special anchorage	60
Beams with no web reinforcement but with special anchorage of longitudinal steel	90
Beams with properly designed web re-inforcement but without special anchorage of longitudinal steel	180
Beams with properly designed web re-inforcement and with special anchorage of longitudinal steel	270
Footings where longitudinal bars have no special anchorage	60
Footings where longitudinal bars have special anchorage	90
d. Bond (u). -	
In beams, slabs, and one way footings	100
Where special anchorage is provided	200
The above stresses are for deformed bars.	

e. Bearing (f_c). -

Where a concrete member has an area

	Lbs. per sq.in.
at least twice the area in bearing	500
f. Axial compression (f_c). -	
Columns with lateral ties	450
g. Steel stresses. -	
Tension	18000
Web reinforcement	16000

h. Protective concrete covering. -

Type of members	Minimum cover in inches
Interior slabs	1-1/2
Interior beams	2
Members poured directly against the ground	4
Members exposed to earth or water but poured against forms	3

For secondary steel, such as temperature and spacer steel, the above minimum cover may be decreased by the diameter of the temperature or spacer steel rods.

B. BASIC ASSUMPTIONS FOR DESIGN. -

1. Roof slab. - The roof slab is of reinforced concrete. It is designed to carry the full dead load plus a live load of 40 pounds per square foot of roof surface.

2. Roof beams. - The roof beams are of structural steel encased in concrete fireproofing. They are designed to carry the full dead load, plus the full live load of 40 pounds per square foot of roof surface. In addition to taking up the roof load, these beams, together with the columns to which they are connected, form portal frames which take up wind load and crane thrusts on the building. The end connections are designed to take up all such horizontal loads.

3. <u>Columns</u>. - <u>a</u>. Structural steel columns in the walls of the superstructure take up the direct roof loads as well as all wind loads on the superstructure. In addition, the columns in the side walls carry crane brackets which support the crane runway. These columns are designed to carry full live and dead load from the roof; dead load, live load and impact effect from the traveling crane; bending due to eccentrically applied loads, and bending due to wind load on the building. No point of inflection was considered in the column designed, a pin-ended condition at the base being assumed.

<u>b</u>. Columns other than the crane columns in the building designed for full dead load and live load from roof, plus wind load on the building.

<u>c</u>. Allowable stress in columns figured from formula

$$P/A = \frac{18000}{1 + \frac{l^2}{18000}}$$

With a maximum allowable stress of 15,000 pounds per square inch for dead load plus live load, and a maximum allowable stress of 20,000 pounds per square inch for combined dead load, live load and wind load; l/r limited not to exceed 120.

4. <u>Pump room</u>.

<u>a</u>. The station is part of the flood protection dike. The walls are of reinforced concrete to Elevation 75.00 and of brick and steel construction from thereon up.

<u>b</u>. In designing the pump room the assumption was made that the whole transverse section acted as a continuous frame. It was assumed that the side members of this transverse section were hinged at the level of the engine room floor, hinged at the level of the wale beams and fully restrained at the level of the pump room floor slab.

c. The continuous frame was investigated for the condition of loading assuming a hydrostatic head on the river side up to Elevation 72.00, while on both the river side and land side saturated earth was assumed to Elevation 66.00. The loading on the base slab was taken as the distributed load of the building less the weight of the base slab.

d. The end walls of the pump room were investigated for two cases:

(1) Case I. - The end walls were assumed supported at the upper edge, supported at an intermediate point 16'-3" above the base slab and fixed at the base.

(2) Case II. - Seventy-five percent fixity at the base was assumed.

Saturated earth was assumed to Elevation 66.00.

When the end walls are fully restrained at the base slab, maximum negative moment occurred while for maximum positive moment only 75 percent fixity occurred between end walls and the base slab.

5. Horizontal walers and cross beams. - In order to decrease the thicknesses of the exterior concrete walls in the substructure, concrete walers and cross beams were placed at Elevation 60.75.

The transverse beams were assumed hinged at the wale beams. The difference in thrust between the riverside and landside wale beams was distributed to the transverse walls at the conduit and by strengthening the wales at these points.

6. Boiler room. - The boiler room floor was designed for a uniform live load of 200#/sq.ft. for the concrete slab and a uniform live

load of 160#/sq.ft. for the concrete beams, except for that portion of the floor slab occupied by the gate hoist. This portion of the floor was designed for the full load on the gate hoist plus the weight of the gate.

7. Intake conduit. - The intake conduit is connected to the existing brick sewer at its south end and to the trash rack chamber at its north end. The conduit varies in section from a rectangle 4 feet wide by 5 feet high at the sewer end to a rectangle 17 feet wide by 8'-6" high at the trash rack chamber end. The conduit was designed as a continuous frame subject to a saturated earth loading. The earth was assumed to be at Elevation 72.0.

8. Trash rack chamber. - The trash rack chamber is attached to the land-side wall of the pumping station. The chamber is 23'-9" high by 17' wide. The trash rack section is 8'-6" high and leads directly into the wet sump and the gravity flow conduit. The transverse section of the chamber was designed as a continuous frame subject to an H-20 loading on the top slab, a uniform load of 100#/sq.ft. on the raking platform, and saturated earth fill on the sidewalls. The south wall of the chamber was designed as a restrained beam acting between the top slab and the raking platform.

9. Discharge conduit. - The discharge conduit is attached to the east face of the dividing wall between the wet and dry sumps. The conduit is 6 feet high by 6 feet wide and was designed as a continuous frame subject to saturated earth loading. During normal flow the conduit operates as a gravity conduit. In flood periods the conduit is closed to flow by a gate in the trash rack chamber, the sewage flow being diverted through the wet sump.

10. Trash racks. - There is one trash rack, in two sections, at this station, located in the intake structure. The rack is made of a structural channel frame which supports 4 x 3/8 inch round edge grating bars spaced 3-1/4 inches in the clear. The rack is welded throughout.

The trash rack is designed on the assumption of stoppage of 50 percent of flow with the water rising above the top of the trash rack.

11. Stairways and ladders. - An open grating steel stairway leads from the dry pump room floor to the engine room floor. A steel ladder is provided on the outside of the building for access to the roof of the building.

C. ARCHITECTURE. - The pumping station will be a building of modern design in keeping with the architectural treatment used on similar projects elsewhere on the Connecticut River. This design will give a pleasing appearance without undue emphasis being placed on purely decorative features.

The pumping station will be a flat-roofed, brick and glass block structure 60'-4" x 24'-0" overall. The 12.5 inch thick brick walls, capped with a cast stone coping, extend above the roof slab to form a parapet wall around the entire roof. A flat-type roof was chosen as being economical and in keeping with the architectural design, as well as serving as a location for the engine exhaust mufflers. The roof system consists of steel beams encased in concrete and supported by steel columns. The roof slab will be 5 inches thick, covered with a cinder concrete fill sloped to drain. There are no outside pilasters. Inside the building there are pilasters at the chimney and at each structural steel column, the pilasters forming fire-proof column encasements. The engine room floor will be 8-inch structural concrete slab, with a monolithic finish. A hand-operated traveling crane of 10 tons lifting capacity will operate for the full length of the building and will be used for installing and moving pumps and machinery. Access for the crane hoist to the pump room will be had through openings in the machinery room floor, these openings being normally covered with removable checkered floor plates.

There is no window sash in the building. Light will be admitted through large glass block panels, glass blocks being chosen in preference to sash because of the exposed location of the pumping station near the river banks. The well-diffused and uniform light which they provide and their appearance is also in keeping with the spirit of the architectural design. To provide ventilation, adjustable louvres have been placed low in the brick walls and a motor operated exhaust ventilator has been placed on the roof.

Two doors give access into the building. The main entrance door, 7 feet wide by 10 feet high, consists of two leaves of hollow steel construction and give entrance directly to the engine room floor. It is large enough to provide adequate clearance for any replacement of mechanical equipment which may be required in the future. The small hollow steel door on the west end of the building provides a service passage.

VIII. CONSTRUCTION PROCEDURE

VIII. CONSTRUCTION PROCEDURE

A. SEQUENCE OF OPERATIONS. - The schedule of work will require the contractor to complete the pumping station and appurtenant works in 250 calendar days after receipt by the contractor of notice to proceed.

B. CONCRETE CONSTRUCTION.

1. Composition of concrete. - The concrete will be composed of cement, fine aggregate, coarse aggregate and water so proportioned and mixed as to produce a plastic, workable mixture. All concrete will be Class A except the pumping station base slab and the manhole base which will be Class B. Class A concrete will have an average compressive stress of not less than 3400 lbs. per square inch in accordance with a standard 28-day test. The average compressive stress for Class B concrete will be 3000 lbs. per square inch in accordance with a standard 28-day test. Concrete aggregates will be of suitable quality and will be tested by the Central Concrete Laboratory at West Point.

2. Laboratory Control. - A small concrete testing laboratory is available in the West Springfield Area of the district for use principally to control the quality of concrete during construction. The tests performed here will supplement those made at the Central Laboratory. Facilities will be available for testing the grading of aggregates, designing concrete mixtures, mixing of trial concrete batches for the purpose of developing actual relations between the compressive strength and the water cement ratio, and the casting of concrete cylinders for compressive strength tests.

a. Cement. - Cement will be tested by the Central Concrete

Laboratory and results of these tests shall be known before the cement is used. Portland cement of a well known and acceptable brand will be used throughout.

b. Fine aggregate. - Natural sand will be used as a fine aggregate. The aggregate will be subject to thorough analysis, including magnesium sulphate soundness tests, and tests made on mortar specimens for compressive strength.

c. Coarse aggregate. - Washed gravel or crushed stone of required sizes will be used as coarse aggregate. It will consist of hard, tough and durable particles free from adherent coating and will be free from vegetable matter. Only a small amount of soft friable, thin or elongated particles will be allowed. The aggregate will be subject to accelerated freezing and thawing tests and to thorough analysis, including magnesium sulphate tests for soundness.

d. Water. - The amount of water used per bag of cement for each batch of concrete will be predetermined; in general, it will be the minimum amount necessary to produce a plastic mixture of the strength specified. Slump tests will be required in accordance with the specifications.

3. Field Control.

a. Storage. - The concrete components will be stored in a thoroughly dry, weather-tight and properly ventilated building. The fine and coarse aggregates will be stored in such a manner that inclusion of foreign material will be avoided.

b. Mixing. - The exact proportions of all materials in the concrete will be predetermined. The mixing will be done in approved mechanical mixers of a rotating type, and there will be adequate facilities for accurate measurement and control of each of the materials used in the concrete. Mixing will be done in batches of sizes as directed and samples will be taken for slump tests and for compressive strength tests. Inspectors will at all times supervise and inspect the mixing procedure.

c. Placing. - Concrete will be placed before the initial set has occurred. Forms will be clean, oiled, rigidly braced and of ample strength. Concrete poured directly against the ground will be placed on clean damp surfaces. Mechanical vibrators will be used and forking or hand spading will be applied adjacent to forms on exposed surfaces to insure smooth, even surfaces. The location of vertical and horizontal construction joints as well as contraction and expansion joints, and the location of upper water stops are indicated on the drawings. The locations of construction joints are tentative and may be changed to suit conditions in the field. Before placing concrete, all reinforcing steel will be inspected and pouring of the concrete will be supervised and directed by Government inspectors. Adequate precautions will be taken if concrete is to be placed in cold or hot weather.

C. STRUCTURAL STEEL CONSTRUCTION. - Structural steel construction consists of the frame work for the superstructure; the walkways and stairway in the pump room; the trash rack, and the miscellaneous frames, angles, checkered plates, crane rails, railings, and ladders.

1. Superstructure framework. - The superstructure framework consists of beams and columns which will form a skeleton frame for the

exterior walls and roof, and will provide a runway for the hand-operated crane. The columns will be securely anchored to the concrete walls and will be connected to the roof beams with web connection angles and wind bracing connections. The crane rails will be fastened to the crane runway beams with bent hook bolts. Crane stops at each end of the runway will prevent the traveling crane from running into the end walls.

2. Walkways and stairways. - The grating for the walkways and stairway treads in the pump room will be supported on structural steel channels. Wrought-iron pipe railings are to be fastened to the top flanges of the stairway channels.

3. Trash racks. - The trash racks are made up of structural channel frames which support 4-inch by 3/8-inch grating bars, spaced 3-1/4 inches in the clear. The racks are welded throughout. A pair of hand-operated two-ton hoists are provided for lifting the racks out of the waterway to aid in clearing them of debris or to permit the pumping station to operate at flood times if the racks become clogged with debris.

4. Removable floor plates. - Access for the crane to the pump room will be obtained by removing checkered floor plates. The removable covers consist of 1/4-inch checkered plates welded to 3 inch x 2-1/2 inch x 5/16 inch angles. Each opening in the floor is covered. Lifting handles are provided in the plates for easy removal.

5. Miscellaneous angles and frames. - Miscellaneous structural steel such as door frames, angles, grilles, etc., will be erected and placed as indicated on the drawings and at such time as required.

IX. SUMMARY OF COST

IX. SUMMARY OF COST

The total construction cost of the Call Street Pumping Station, including the intake structure, the discharge structure and the mechanical equipment, has been estimated to be $134,000 including 10% for contingencies and 15% for engineering and overhead.

This amount has been distributed as follows:

(1) Pumping station.

a. Concrete.	$20,500	
b. Superstructure.	17,800	
c. Miscellaneous	9,800	
Total		$ 48,100

(2) Conduit.

a. Concrete.	$ 3,800	
b. Miscellaneous	5,500	
Total		$ 9,300
(3) Mechanical equipment.		76,600
TOTAL		$134,000

(1) a. The concrete features included under the pumping station item (1) a. consist of intake structures, building foundation to and including operating floor structural slab and suction intake.

(1) b. The superstructure consists of the complete building above the operating floor.

(1) c. Miscellaneous items are common excavation and backfill, miscellaneous iron and steel, trash racks, and other items not included in (1) a and (1) b.

(2) a. The concrete under the conduit item (2) is the conduit complete.

(2) b. Miscellaneous items are common excavation and backfill.

(3) The mechanical equipment consists of pumps, gas engines, gear units, crane, generating units, valves and piping, sluice gates and miscellaneous items.

PLATES

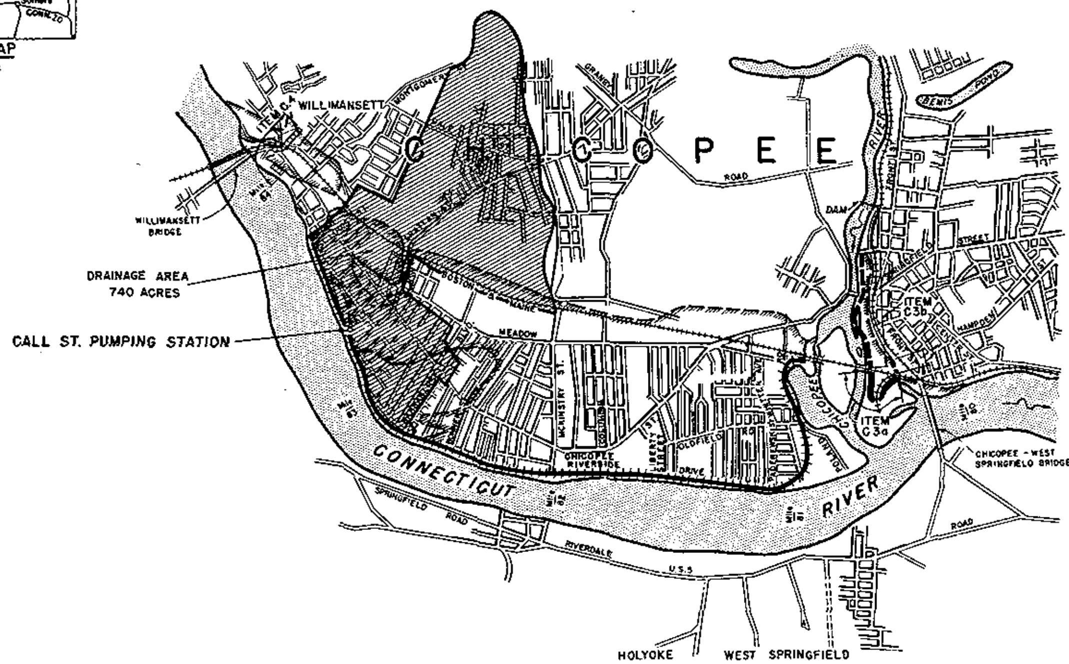
INDEX OF PLATES

WAR DEPARTMENT

CORPS OF ENGINEERS, U. S. ARMY

LOCATION MAP

SCALE 1"=8 MILES



VICINITY MAP

SCALE 1"=1500'

INDEX TO DRAWINGS

SHEET NO.	TITLE	DRAWING NO.
1	PROJECT LOCATION AND INDEX	CT-4-2426
2	GENERAL PLAN	CT-4-2427
3	PLAN OF INTAKE, WET WELL AND OUTLET	CT-4-2428
4	STAGE HYDROGRAPH NO.1	CT-3-1169
5	STAGE HYDROGRAPH NO.2	CT-3-1170
6	SUBSURFACE EXPLORATIONS	CT-2-1273
7	GRAVITY DISCHARGE CONDUIT	CT-4-2429
8	INTAKE STRUCTURE	CT-4-2430
9	ENGINE ROOM FLOOR PLAN - ARCHITECTURAL	CT-4-2431
10	ROOF PLAN AND DETAILS - ARCHITECTURAL	CT-4-2432
11	ELEVATIONS NO.1 - ARCHITECTURAL	CT-4-2433
12	ELEVATIONS NO.2 - ARCHITECTURAL	CT-4-2434
13	SECTIONS - ARCHITECTURAL	CT-4-2435
14	ENTRANCE DETAILS - ARCHITECTURAL	CT-4-2436
15	MISCELLANEOUS DETAILS - ARCHITECTURAL	CT-4-2437
16	ROOF SLAB	CT-4-2438
17	STRUCTURAL STEEL FRAMING	CT-4-2439
18	STRUCTURAL STEEL DETAILS	CT-4-2440
19	ENGINE ROOM FLOOR SLAB	CT-4-2441
20	ENGINE ROOM FLOOR BEAMS	CT-4-2442
21	BOILER ROOM FLOOR - SLAB AND BEAMS	CT-4-2443
22	PUMP ROOM FLOOR SLAB	CT-4-2444
23	SECTIONS AND WALES	CT-4-2445
24	WET SUMP STAIRWAY	CT-4-2446
25	WALL ELEVATIONS-REINFORCEMENT NO. 1	CT-4-2648
26	WALL ELEVATIONS-REINFORCEMENT NO. 2	CT-4-2649
27	WALL ELEVATIONS-REINFORCEMENT NO. 3	CT-4-2650
28	WALL ELEVATIONS-REINFORCEMENT NO. 4	CT-4-2651
29	DETAILS OF DIVIDING WALL AND INTERIOR CONDUIT	CT-4-2652
30	HORIZONTAL SECTION AND DISCHARGE CONDUIT DETAILS	CT-4-2653
31	INTAKE STRUCTURE - REINFORCEMENT NO.1	CT-4-2654
32	INTAKE STRUCTURE - REINFORCEMENT NO.2	CT-4-2655
33	INTAKE STRUCTURE - REINFORCEMENT NO.3	CT-4-2447
34	TANK SUPPORTS	CT-4-2448
35	MISCELLANEOUS METAL NO.1	CT-4-2449
36	MISCELLANEOUS METAL NO.2	CT-4-2450
37	MISCELLANEOUS METAL NO. 3	CT-4-2451
38	MISCELLANEOUS METAL NO.4	CT-4-2452
39	STAIRWAY TO DRY PUMP ROOM	CT-4-2453
40	MISCELLANEOUS RAILINGS	CT-4-2454
41	TRASH RACK	CT-4-2455
42	GENERAL ARRANGMENT OF EQUIPMENT NO. 1	CT-4-2456
43	GENERAL ARRANGMENT OF EQUIPMENT NO.2	CT-4-2457
44	PLUMBING AND HEATING NO.1	CT-4-2458
45	PLUMBING AND HEATING NO. 2	CT-4-2459
46	PLUMBING AND HEATING NO. 3	CT-4-2460
47	GASOLINE PIPING NO.1	CT-4-2461
48	GASOLINE PIPING NO.2	CT-4-2462
49	SLUICE GATES	CT-4-2463
50	EXHAUST PIPING	CT-4-2464
51	ELECTRIC LIGHT AND POWER NO. 1	CT-4-2465
52	ELECTRIC LIGHT AND POWER NO. 2	CT-4-2466
53	ELECTRIC LIGHT AND POWER NO. 3	CT-4-2467

LEGEND

Dikes completed Item C1 and C2.

Item C.3a Fiscal Year 1940 Unit, West of B&M.R.R. South Bank Chicopee River.

Item C.3b Future Construction, Fiscal Year 1940 Unit, South Bank Chicopee River.

Item C.4 Fiscal Year 1940 Section Willimansett Dike

Overflow Limits, March 1936 Flood.

KEY	DATE	REVISION - Indicated by Δ	REV. BY	CK. BY	AP. BY

CONNECTICUT RIVER FLOOD CONTROL

CALL STREET PUMPING STATION

CHICOPEE, MASS.

PROJECT LOCATION AND INDEX

CONNECTICUT RIVER MASSACHUSETTS

IN 53 SHEETS SCALE 1 IN. = 1500 FT SHEET NO. 1

U. S. ENGINEER OFFICE, PROVIDENCE, R.I., MAY 1940

SUBMITTED: SENIOR ENGINEER, HEAD, DESIGN SECTION
APPROVAL RECOMMENDED: PRINCIPAL ENGINEER, CHIEF, F.C. ENGINEERING DIV.
APPROVED: LT. COL., CORPS OF ENGINEERS, DISTRICT ENGINEER

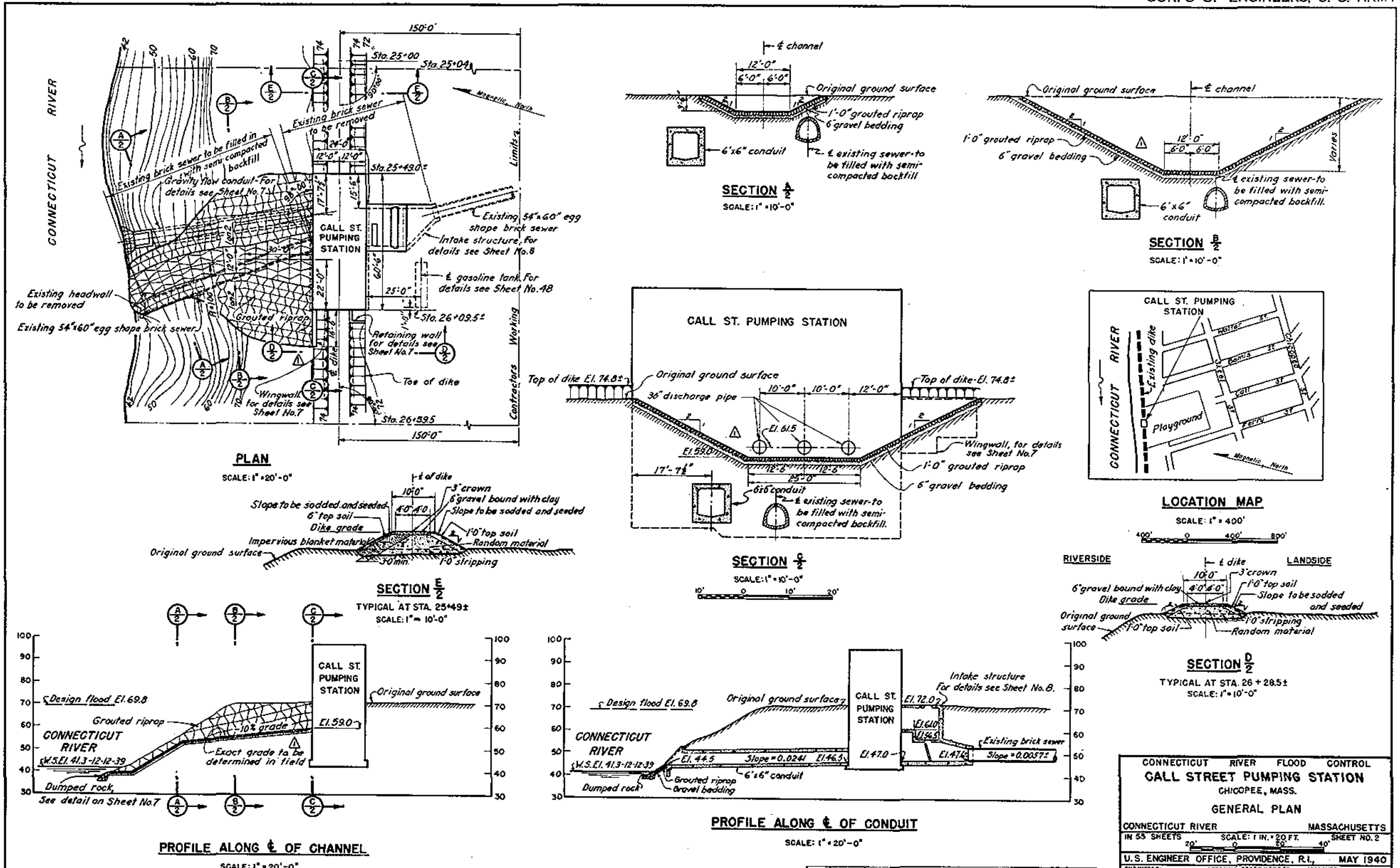
DESIGNED: P. C. Hunnicomb, ASST. ENGINEER
DRAWN: W.S.B. TRACED: L.J.B. CHECKED:

FISCAL YEAR 1940
FILE NO. CT-4-2426

C. 5d

1

PLATE NO. 1



KEY	DATE	REVISION (Indicated by △)	REV. BY	CK. BY	AP. BY
△	7-15-40	Reference Addendum No.1 - Wingwall added - Pump. outlet & channel lowered			

CONNECTICUT RIVER FLOOD CONTROL

CALL STREET PUMPING STATION

CHICOPEE, MASS.

GENERAL PLAN

CONNECTICUT RIVER — MASSACHUSETTS

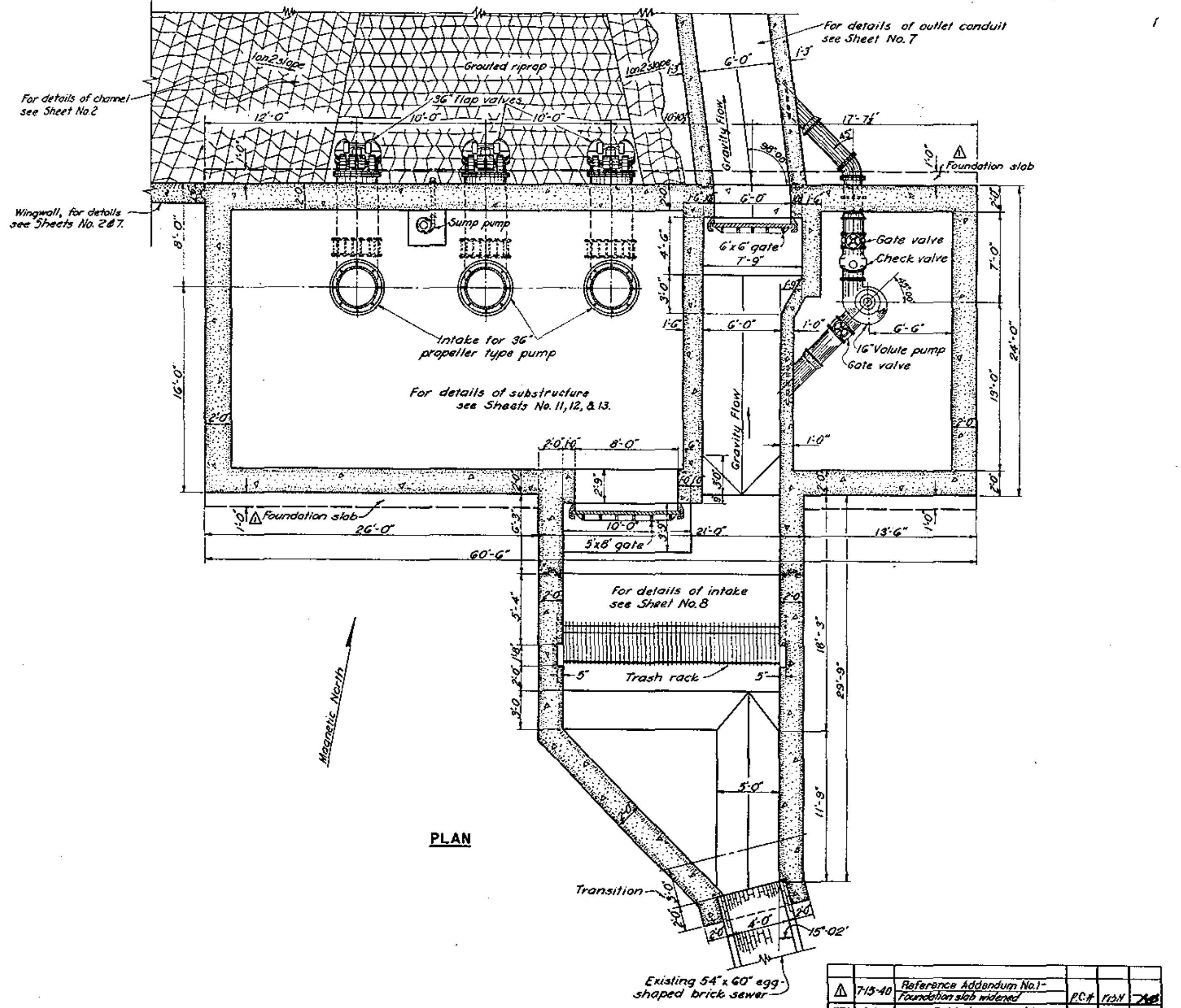
IN 53 SHEETS — SCALE: 1 IN. = 20 FT. — SHEET NO. 2

U.S. ENGINEER OFFICE, PROVIDENCE, R.I., MAY 1940

FISCAL YEAR 1940

FILE NO. CT-4-2427

PLATE NO. 2



PLAN

KEY	DATE	REVISION (Indicated by Δ)	REV. BY	CK. BY	AP. BY
Δ	7-15-40	Reference Addendum No.1- Foundation slab widened	P.C.H.	[illegible]	[illegible]

CONNECTICUT RIVER FLOOD CONTROL

CALL STREET PUMPING STATION

CHICOPEE, MASS.

PLAN OF INTAKE
WET WELL AND OUTLET

CONNECTICUT RIVER MASSACHUSETTS

IN 53 SHEETS SCALE: 1/4 IN. = 1 FT SHEET NO. 3

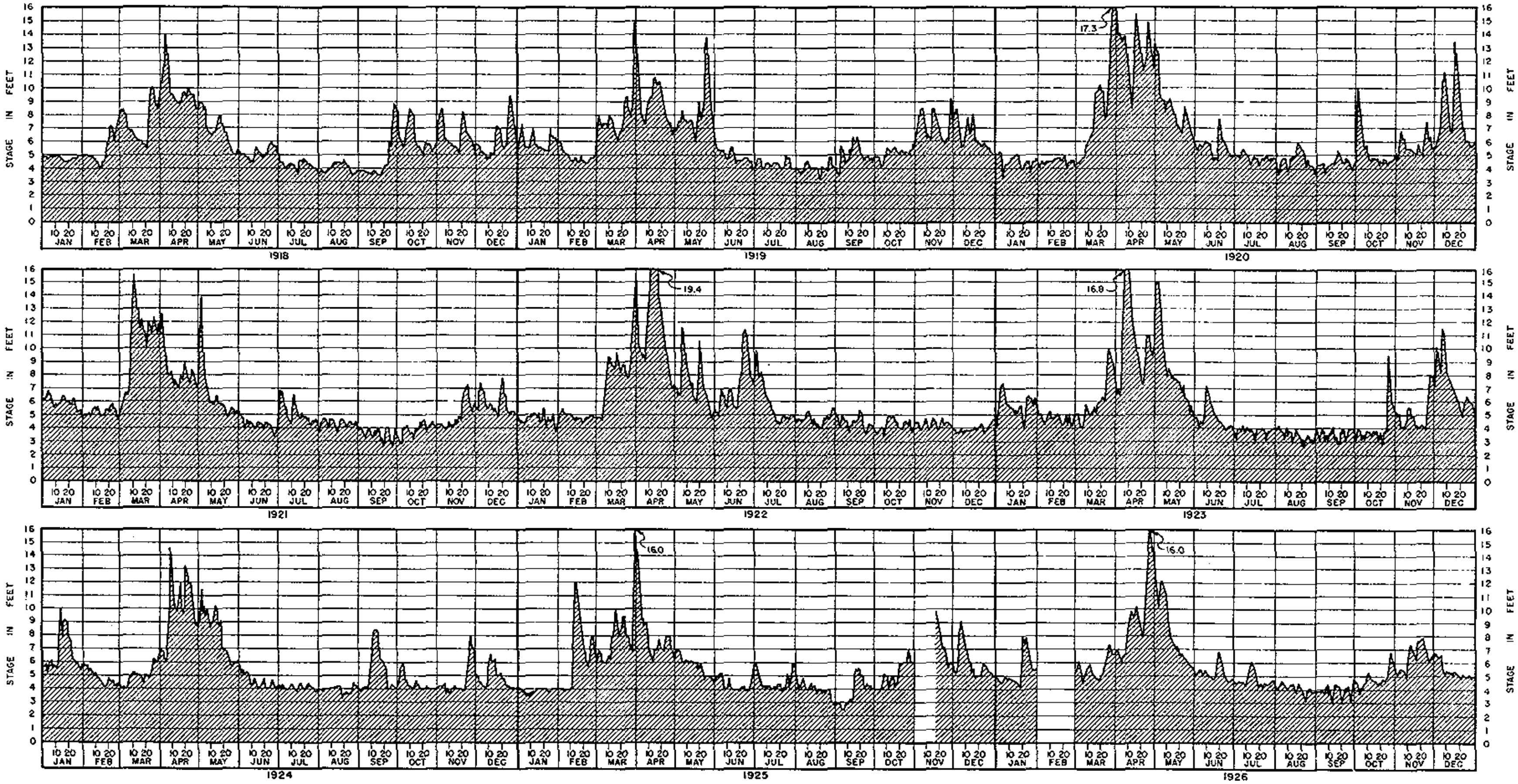
U.S. ENGINEER OFFICE, PROVIDENCE, R.I. MAY 1940

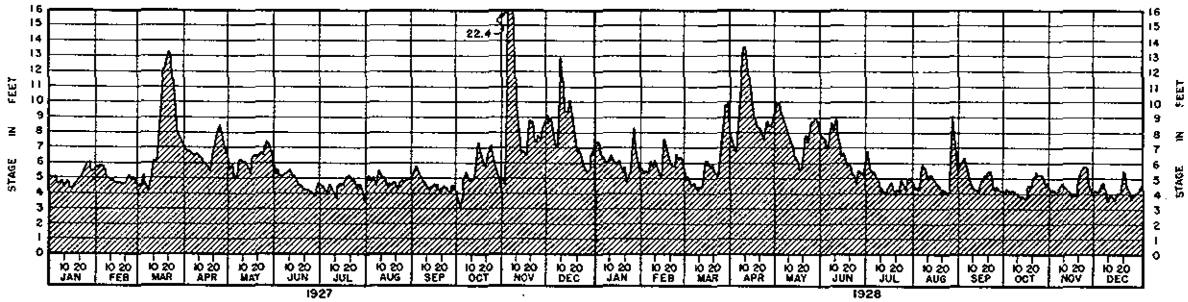
SUBMITTED: SENIOR ENGINEER, HEAD, DESIGN SECTION
APPROVAL RECOMMENDED: PRINCIPAL ENGINEER, CHIEF, F.C. ENGINEERING DIV.
APPROVED: LT. COL. CORPS OF ENGINEERS, DISTRICT ENGINEER
DESIGNED: P.C. Hancock, ASST. ENGINEER

FISCAL YEAR 1940
FILE NO. CT-4-2428

WAR DEPARTMENT

CORPS OF ENGINEERS, U. S. ARMY





NOTES

Stage records at Springfield obtained from United States Weather Bureau and from the Department of Streets and Engineering, City of Sprinfield.

Recording gage located on upstream side of Memorial Bridge, Springfield, Mass.

Zero of gage is at elevation 37.3 m.s.l.

For stage relation curve, see Sheet No. 5, File No. CT-3-1170.

KEY	DATE	REVISION (indicated by Δ)	REV. BY	CK. BY	AP. BY

CONNECTICUT RIVER FLOOD CONTROL

CALL STREET PUMPING STATION

CHICOPEE, MASS.

STAGE HYDROGRAPH NO. 1

CONNECTICUT RIVER — MASSACHUSETTS

IN 53 SHEETS — SHEET NO. 4

SCALE AS SHOWN

U. S. ENGINEER OFFICE, PROVIDENCE, R. I., MAY 1940

SUBMITTED: HEAD, HYDRAULICS SECTION — APPROVAL RECOMMENDED: PRINCIPAL ENGINEER, CHIEF F. C. ENGINEERING DIV. — APPROVED: LT. COL., CORPS OF ENGINEERS, DISTRICT ENGINEER

COMPILED: ASSOC. ENGINEER — DRAWN: WEN & GAL. TRACED: L.H.P. CHECKED: C.S.

FISCAL YEAR 1940

FILE NO. CT-3-1169

C. 5d

4

PLATE NO. 4

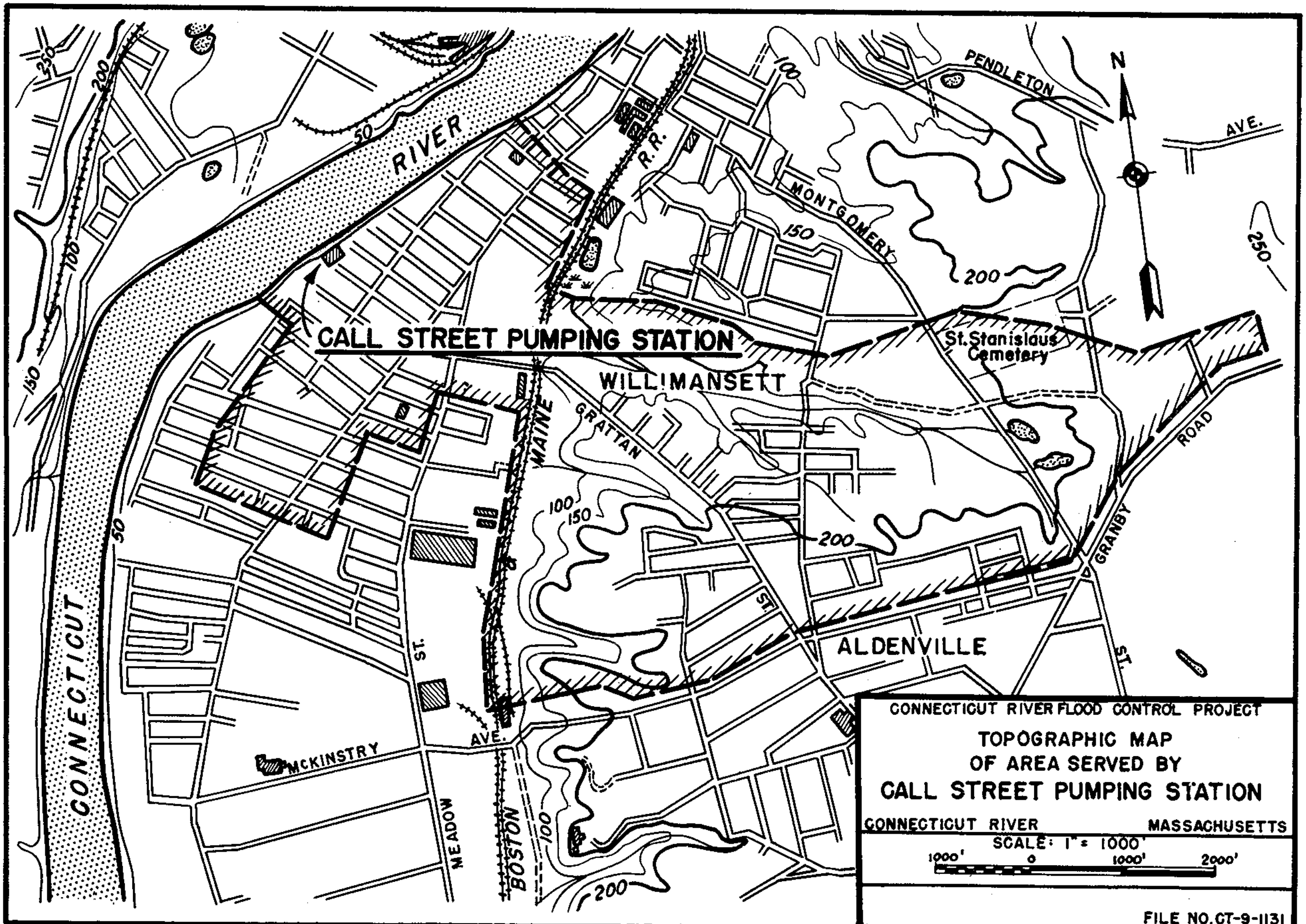
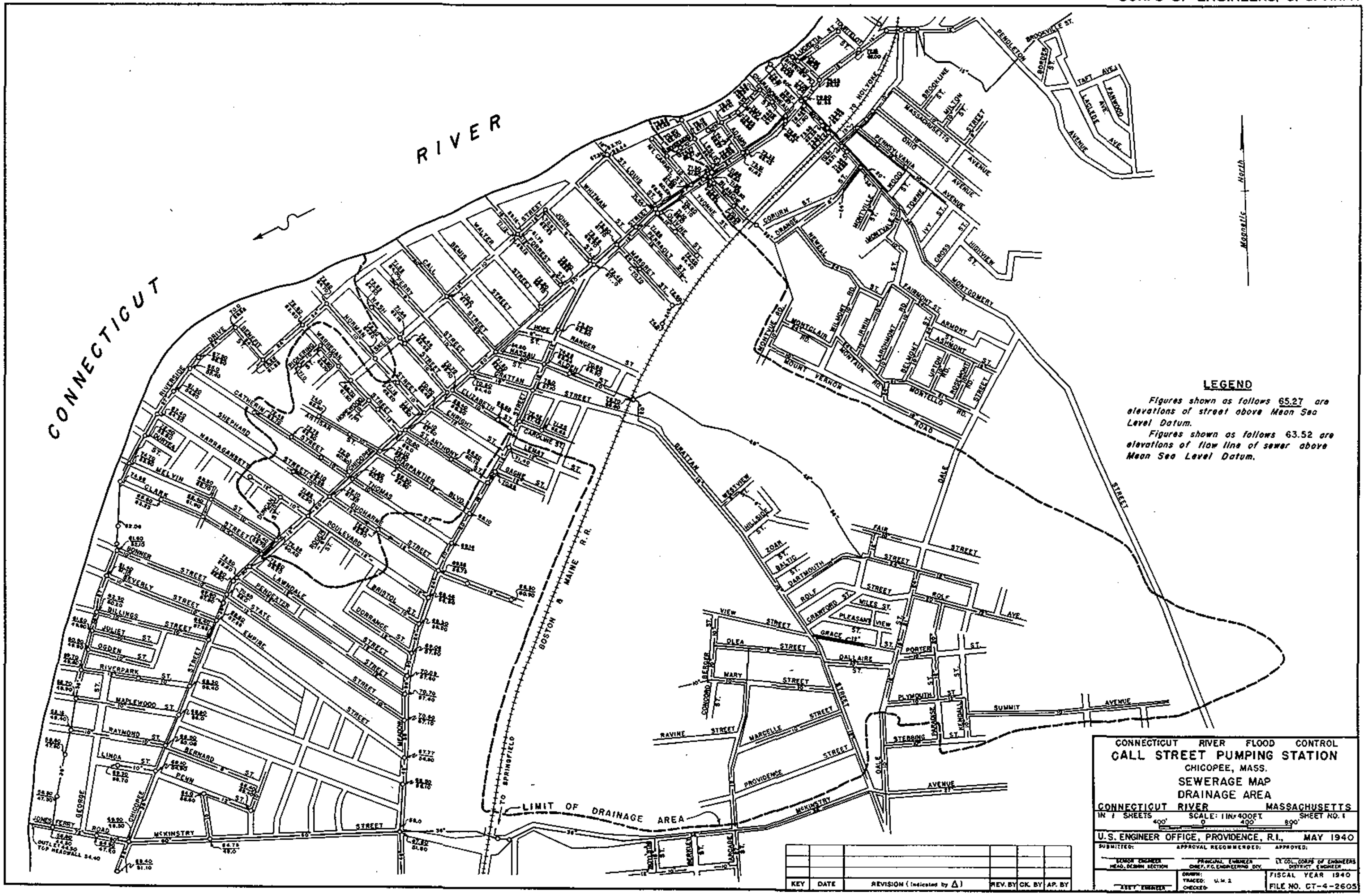
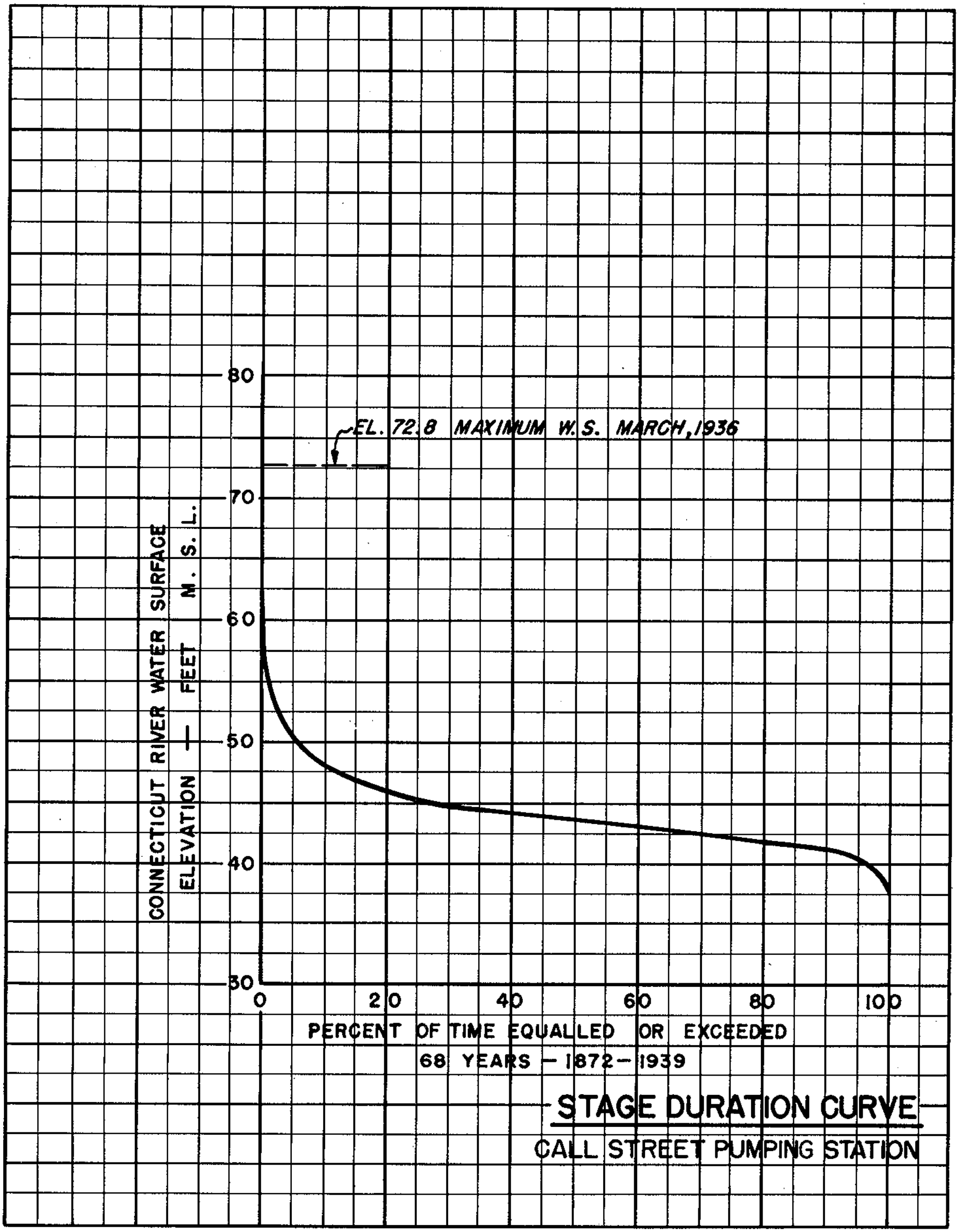

CONNECTICUT
RIVER
CALL STREET PUMPING STATION
WILLIMANSETT
St. Stanislaus Cemetery
ALDENVILLE
PENDLETON
AVE.
MONTGOMERY
GRATTAN
ST.
R.R.
BOSTON
MAINE
MEADOW
ST.
MCKINSTRY
AVE.
GRANBY
ROAD
ST.
N
50
100
150
200
250
230
CONNECTICUT RIVER FLOOD CONTROL PROJECT
TOPOGRAPHIC MAP
OF AREA SERVED BY
CALL STREET PUMPING STATION
CONNECTICUT RIVER
MASSACHUSETTS
SCALE: 1" = 1000'
1000' 0 1000' 2000'
FILE NO. CT-9-1131

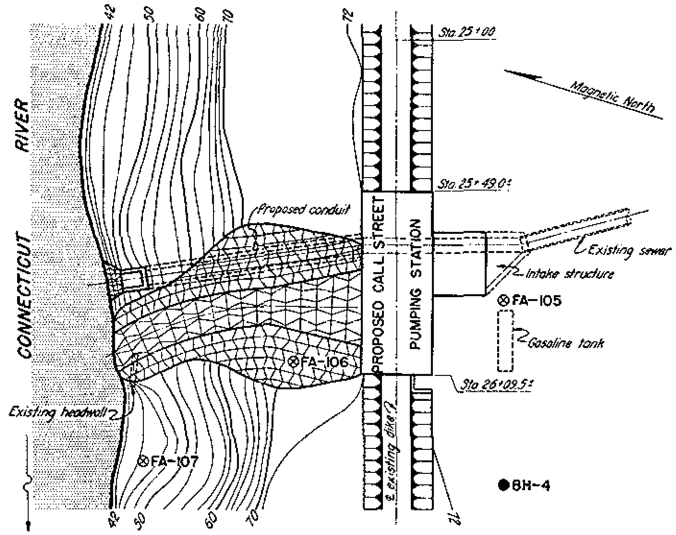
PLATE NO. 6


CONNECTICUT RIVER
LIMIT OF DRAINAGE AREA
BOSTON & MAINE R.R.
TO SPRINGFIELD
TO HOLYOKE
Magnetic North
LEGEND
Figures shown as follows 65.27 are elevations of street above Mean Sea Level Datum.
Figures shown as follows 63.52 are elevations of flow line of sewer above Mean Sea Level Datum.
CONNECTICUT RIVER FLOOD CONTROL
CALL STREET PUMPING STATION
CHICOPEE, MASS.
SEWERAGE MAP
DRAINAGE AREA
CONNECTICUT RIVER MASSACHUSETTS
IN 1 SHEETS
SCALE: 1 IN.=400 FT.
SHEET NO. 1
U.S. ENGINEER OFFICE, PROVIDENCE, R.I., MAY 1940
FISCAL YEAR 1940
FILE NO. CT-4-2605
KEY
DATE
REVISION (Indicated by Δ)
REV. BY
CK. BY
AP. BY



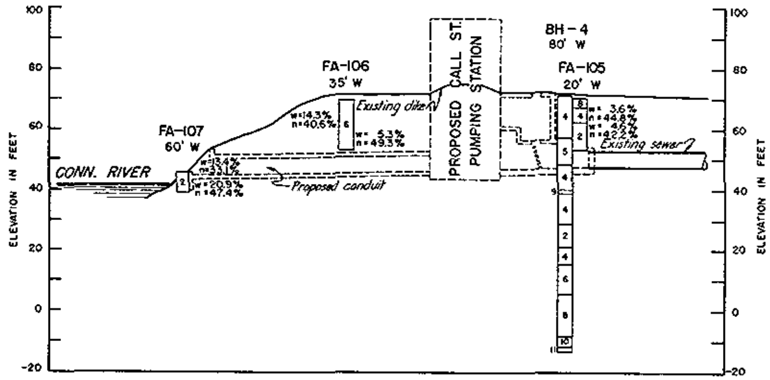
EL. 72.8 MAXIMUM W.S. MARCH, 1936
CONNECTICUT RIVER WATER SURFACE
ELEVATION — FEET M. S. L.
30
40
50
60
70
80
0
20
40
60
80
100
PERCENT OF TIME EQUALLED OR EXCEEDED
68 YEARS — 1872 — 1939
STAGE DURATION CURVE
CALL STREET PUMPING STATION

PLATE NO. 8



PLAN

SCALE: 1"=20'



PROFILE ALONG ℄ CONDUIT

SCALE: 1"=20'

DESCRIPTION OF SOIL CLASSES

- [1] Graded from Gravel to Coarse Sand – Contains little medium sand.
- [2] Coarse to Medium Sand – Contains little gravel and fine sand.
- [3] Graded from Gravel to Medium Sand – Contains little fine sand.
- [4] Medium to Fine Sand – Contains little coarse sand and coarse silt.
- [5] Graded from Gravel to Fine Sand – Contains little coarse silt.
- [6] Fine Sand to Coarse Silt – Contains little medium sand and medium silt.
- [7] Graded from Gravel to Coarse Silt – Contains little medium silt.
- [8] Coarse to Medium Silt – Contains little fine sand and fine silt.
- [9] Graded from Gravel to Medium Silt – Contains little fine silt.
- [10] Medium to Fine Silt – Contains little coarse silt and coarse clay. Possesses behavior characteristics of silt.
- [10C] Medium Silt to Coarse Clay – Contains little coarse silt and medium clay. Possesses behavior characteristics of clay.
- [11] Graded from Gravel or Coarse Sand to Fine Silt – Contains little coarse clay.
- [12] Fine Silt to Clay – Contains little medium silt and fine clay (colloids). Possesses behavior characteristics of silt.
- [12C] Clay – Contains little silt. Possesses behavior characteristics of clay.
- [13] Graded from Coarse Sand to Clay – Contains little fine clay (colloids). Possesses behavior characteristics of silt.
- [13C] Clay – Graded from sand to fine clay (colloids). Possesses behavior characteristics of clay.

LEGEND

- ● BH *Drive sample bore hole.*
- ⊗ FA *Foundation auger boring.*
- W *West of ℄ conduit.*
- w *Water content in natural state* $= \frac{\text{Weight of water}}{\text{Weight of solids}}$
- n *Porosity in natural state* $= \frac{\text{Volume of voids}}{\text{Total volume}}$

NOTES

Elevations refer to Mean Sea Level Datum.

Samples, test results, and logs pertaining to the materials from explorations are available for inspection by interested parties at the United States Engineer Office, Providence, R.I.

KEY	DATE	REVISION (Indicated by Δ)	REV. BY	CK. BY	AP. BY

CONNECTICUT RIVER FLOOD CONTROL

CALL STREET PUMPING STATION

CHICOPEE, MASS.

SUBSURFACE EXPLORATIONS

CONNECTICUT RIVER MASSACHUSETTS

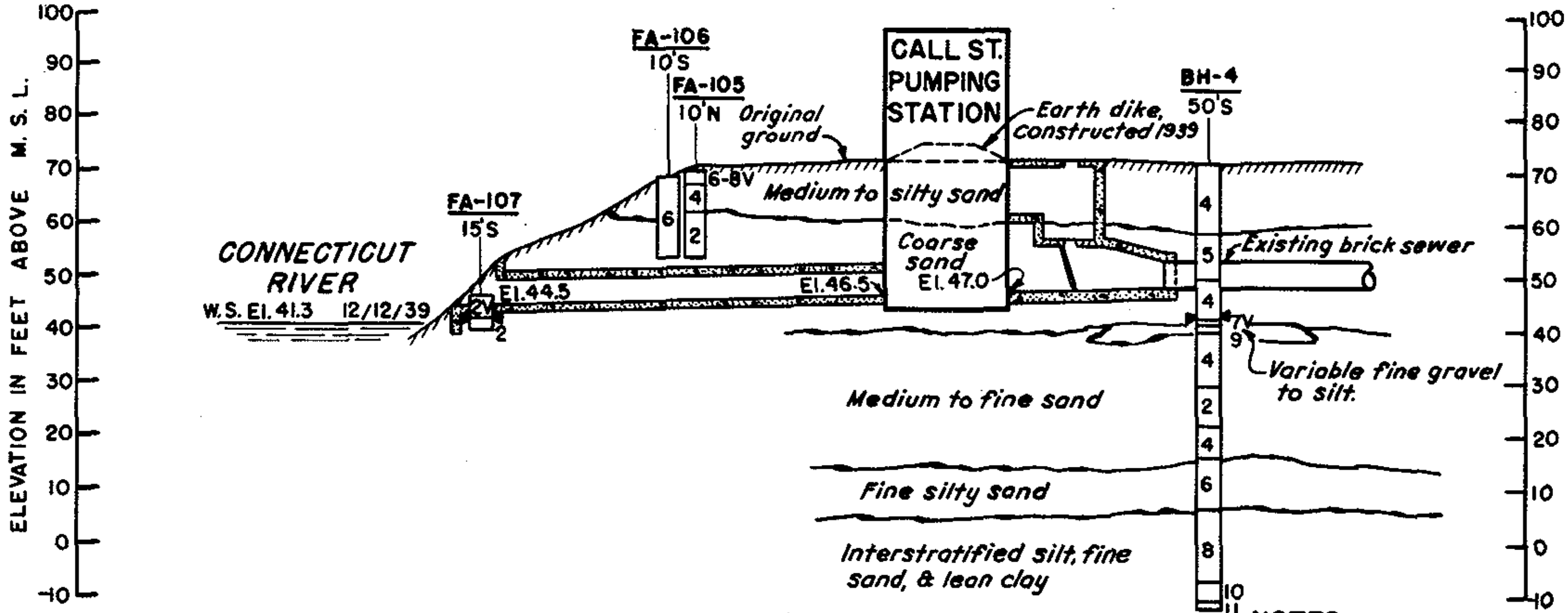
IN SHEET SCALE: 1 IN. = 20 FT. 20' 0 20' 40' SHEET NO.

U. S. ENGINEER OFFICE, PROVIDENCE, R.I., MAY 1940

SUBMITTED: [signature] SENIOR GEOLOGIST HEAD, GEOLOGY SECTION | APPROVAL RECOMMENDED: [signature] PRINCIPAL ENGINEER CHIEF, F.C. ENGINEERING DIV. | APPROVED: [signature] LT. COL., CORPS OF ENGINEERS DISTRICT ENGINEER

COMPILED: [signature] ASST. ENGINEER | DRAWN: W.A.S., JR. TRACED: J.E.D. CHECKED: W.O.L. jr | FISCAL YEAR 1940 FILE NO. CT-2-1285

A. of D. C. 5d



NOTES

Ground water at time of exploration shown thus ▶◀.

Numbers indicate Providence District Soil Classification.

PROFILE ALONG ℄ CONDUIT

GEOLOGIC & SOIL PROFILE CALL ST. PUMPING STATION CHICOPEE, MASS. C.5d	
FLOOD CONTROL ENG. DIV.; SOILS LABORATORY	
U.S. ENGINEER OFFICE, PROVIDENCE, R.I.	
SUBMITTED BY: W.I.K.	SCALE: 1 IN. = 20 FT. 10' 0 10' 20'
ANALYSIS BY: R.A.B.	
DRAWN BY: H.M.	S.L. No. C.5d - A1d
DATE: APRIL 27, 1940	PLATE NO. 11

PROVIDENCE DISTRICT SOIL CLASSIFICATION

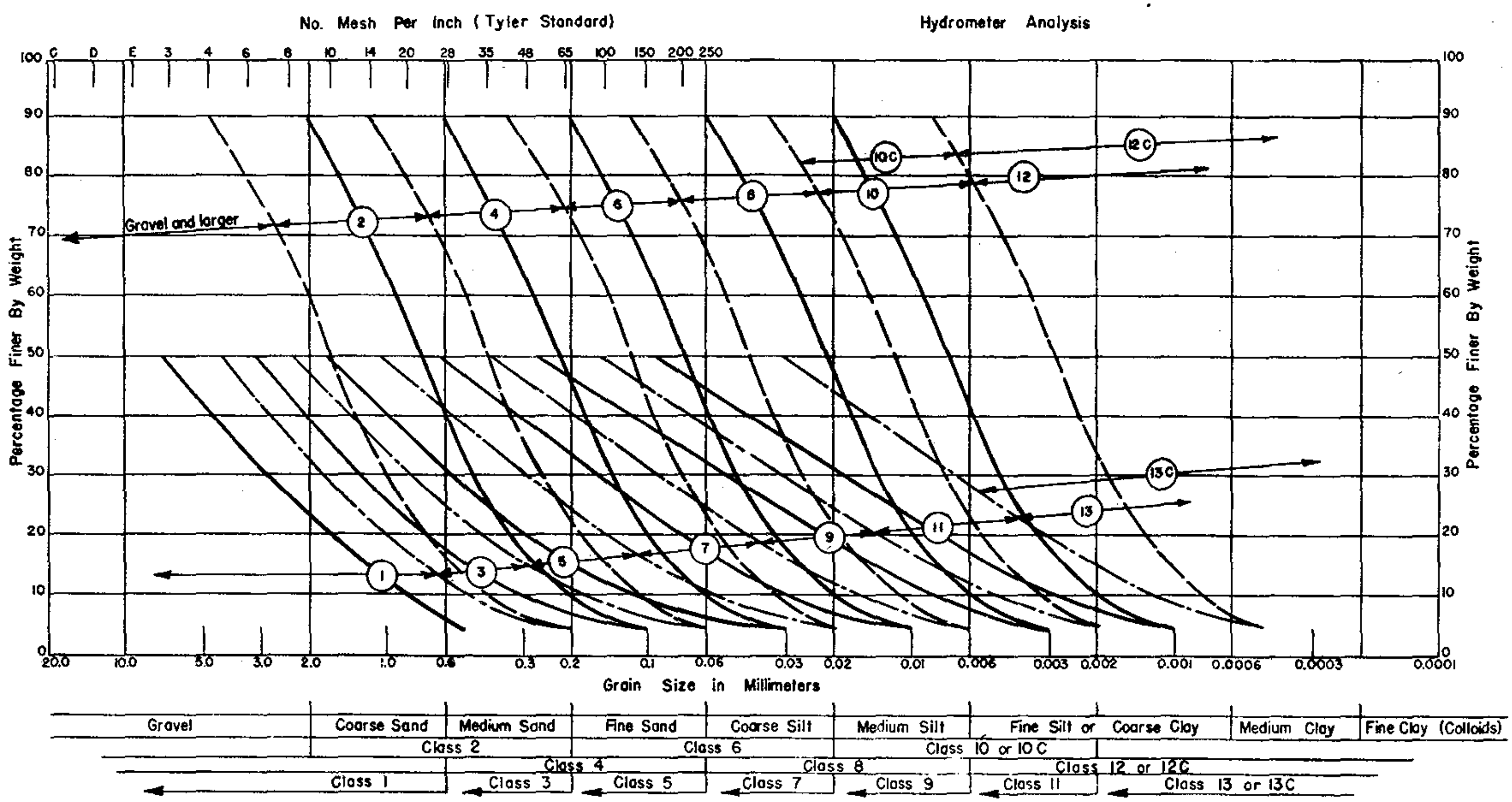
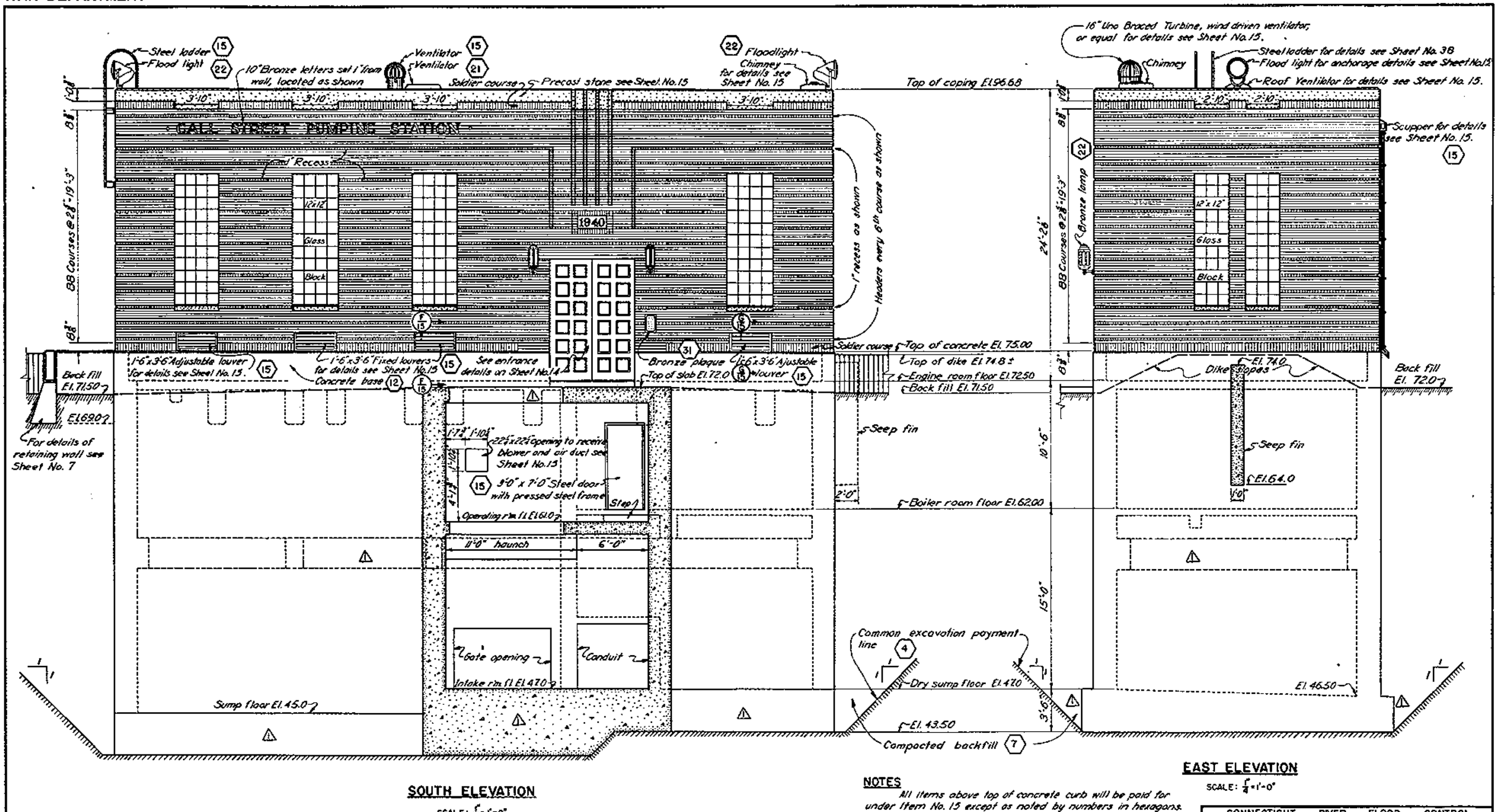


DIAGRAM SHOWING LIMITS OF SOIL CLASSES

PLATE NO. 11

WAR DEPARTMENT

CORPS OF ENGINEERS, U. S. ARMY



NOTES

All items above top of concrete curb will be paid for under Item No. 15 except as noted by numbers in hexagons.

All vertical brick dimensions are from bottom of brick joint to bottom of brick joint unless otherwise noted.

Brick dimensions are based on standard brick $2\frac{1}{4}" \times 3\frac{3}{4}" \times 8"$ with $\frac{3}{8}"$ joints.

KEY	DATE	REVISION (Indicated by △)	REV. BY	CK. BY	AP. BY
△	7-15-40	Reference Addendum No. 1 - Extension of base slab & lowering motors	J.C.S.	[illegible]	[illegible]

CONNECTICUT RIVER FLOOD CONTROL

GALL STREET PUMPING STATION

CHICOPEE, MASS.

ELEVATIONS NO. 1

ARCHITECTURAL

CONNECTICUT RIVER — MASSACHUSETTS

IN 53 SHEETS — SCALE: 1/4 IN. = 1 FT. — SHEET NO. 11

U.S. ENGINEER OFFICE, PROVIDENCE, R.I., MAY 1940

SUBMITTED: Senior Engineer, Head, Design Section — APPROVAL RECOMMENDED: Principal Engineer, Chief, F.C. Engineering Div. — APPROVED: Lt. Col., Corps of Engineers, District Engineer

DESIGNED: — DRAWN: V.A.S. — TRACED: F.G.H. — CHECKED:

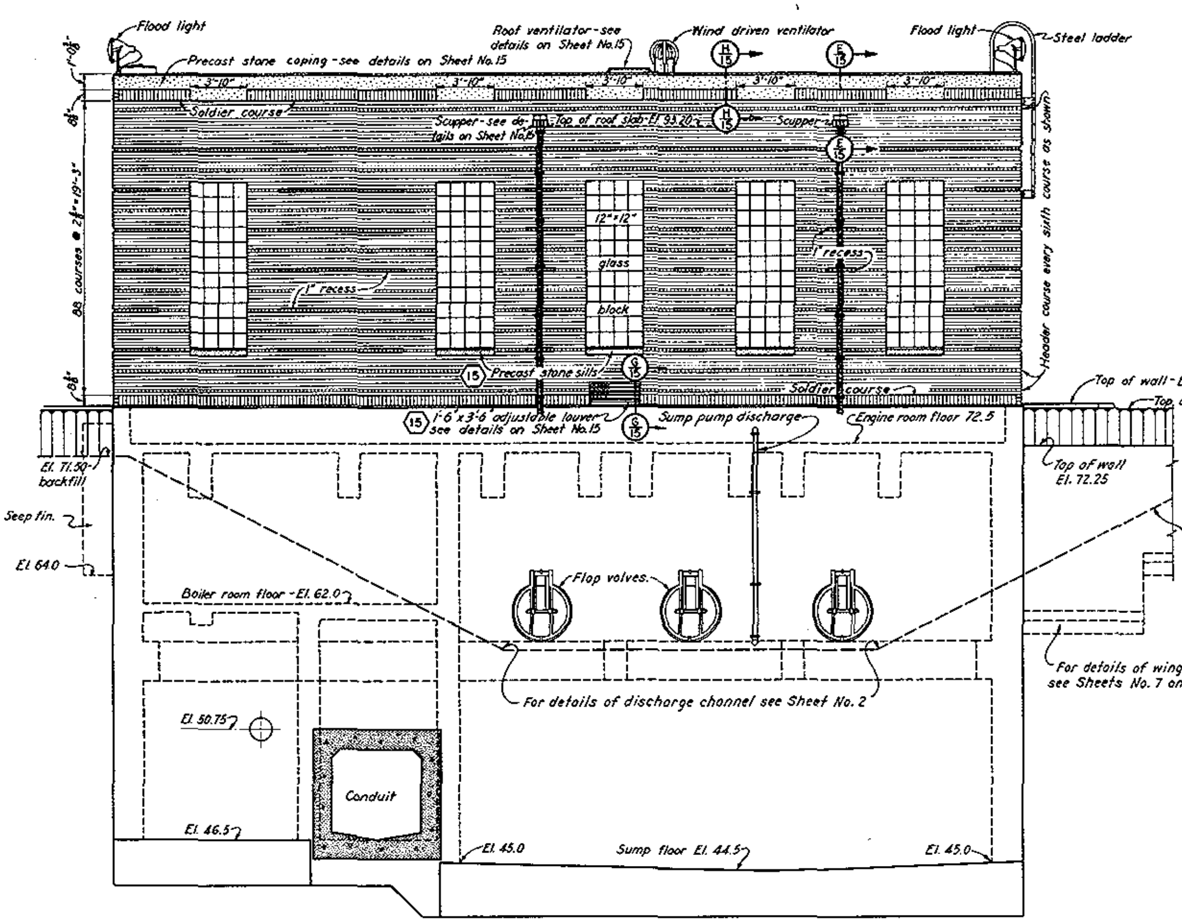
FISCAL YEAR 1940

FILE NO. CT-4-2433

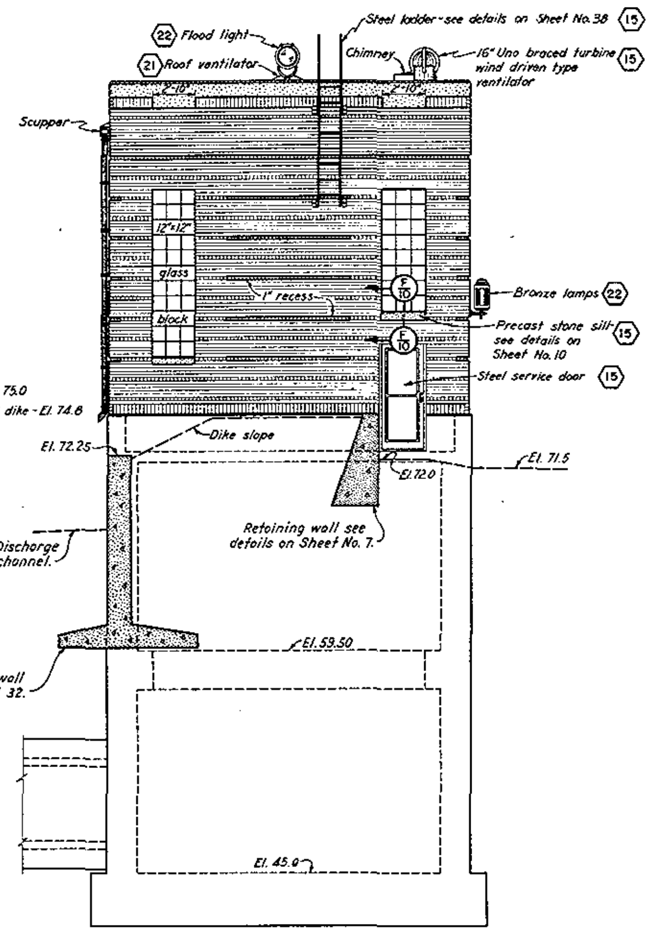
C. 5d

(11)

PLATE NO. 12



NORTH ELEVATION △



WEST ELEVATION △

NOTES

All items above concrete curb will be paid for under Item No. 15 except as indicated by numbers in hexagons.

All vertical brick dimensions are from bottom of brick joint to bottom of brick joint unless otherwise noted.

Brick dimensions are based on standard brick $2\frac{1}{4}" \times 3\frac{3}{4}" \times 8"$ with $\frac{3}{8}"$ joints.

KEY	DATE	REVISION (Indicated by △)	REV. BY	CK. BY	AP. BY
△	7-15-40	Reference Addendum No. 1 - Elevation of outlets changed Foundation altered	J.C.S.		

CONNECTICUT RIVER FLOOD CONTROL
CALL STREET PUMPING STATION
CHICOPEE, MASS.
ELEVATIONS NO. 2
ARCHITECTURAL

CONNECTICUT RIVER MASSACHUSETTS
IN 53 SHEETS SCALE: 1/4 IN. = 1 FT. SHEET NO. 12

U.S. ENGINEER OFFICE, PROVIDENCE, R.I. MAY 1940

SUBMITTED: SENIOR ENGINEER HEAD, DESIGN SECTION — APPROVAL RECOMMENDED: PRINCIPAL ENGINEER CHIEF, F.C. ENGINEERING DIV. — APPROVED: LT. COL. CORPS OF ENGINEERS DISTRICT ENGINEER

DESIGNED: DRAWN: D.G. TRACED: CHECKED:

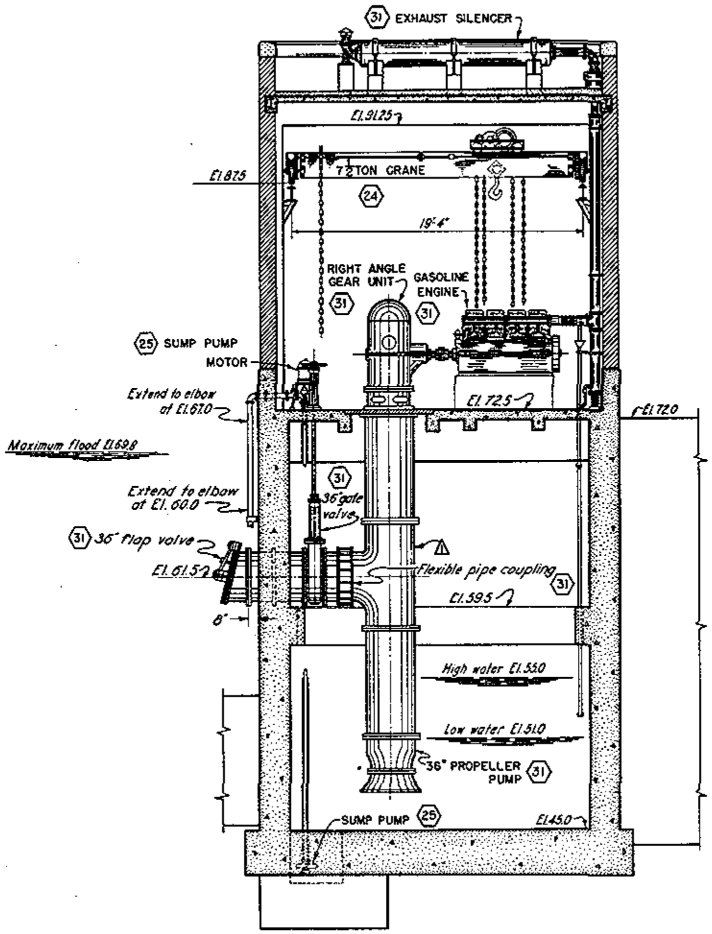
FISCAL YEAR 1940
FILE NO. CT-4-2434

C. 5d (12)

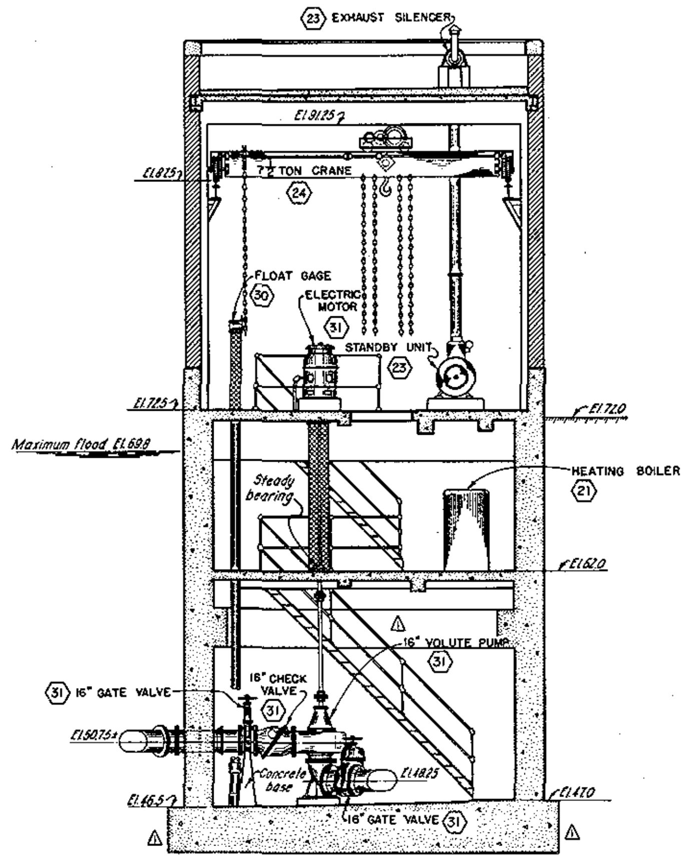
PLATE NO. 13

WAR DEPARTMENT

CORPS OF ENGINEERS, U. S. ARMY



SECTION $\frac{A}{42}$



SECTION $\frac{B}{42}$

KEY	DATE	REVISION (Indicated by △)	REV. BY	CK. BY	AP. BY
△	7-15-40	Reference Addendum No. 1 - Gate valve added - Water moved - Gear unit moved	HAK	NSV	JKS

CONNECTICUT RIVER FLOOD CONTROL

CALL STREET PUMPING STATION

CHICOPEE, MASS.

GENERAL ARRANGEMENT OF EQUIPMENT NO. 2

CONNECTICUT RIVER — MASSACHUSETTS

IN 63 SHEETS — SCALE: 1/4 IN. = 1 FT. — SHEET NO. 43

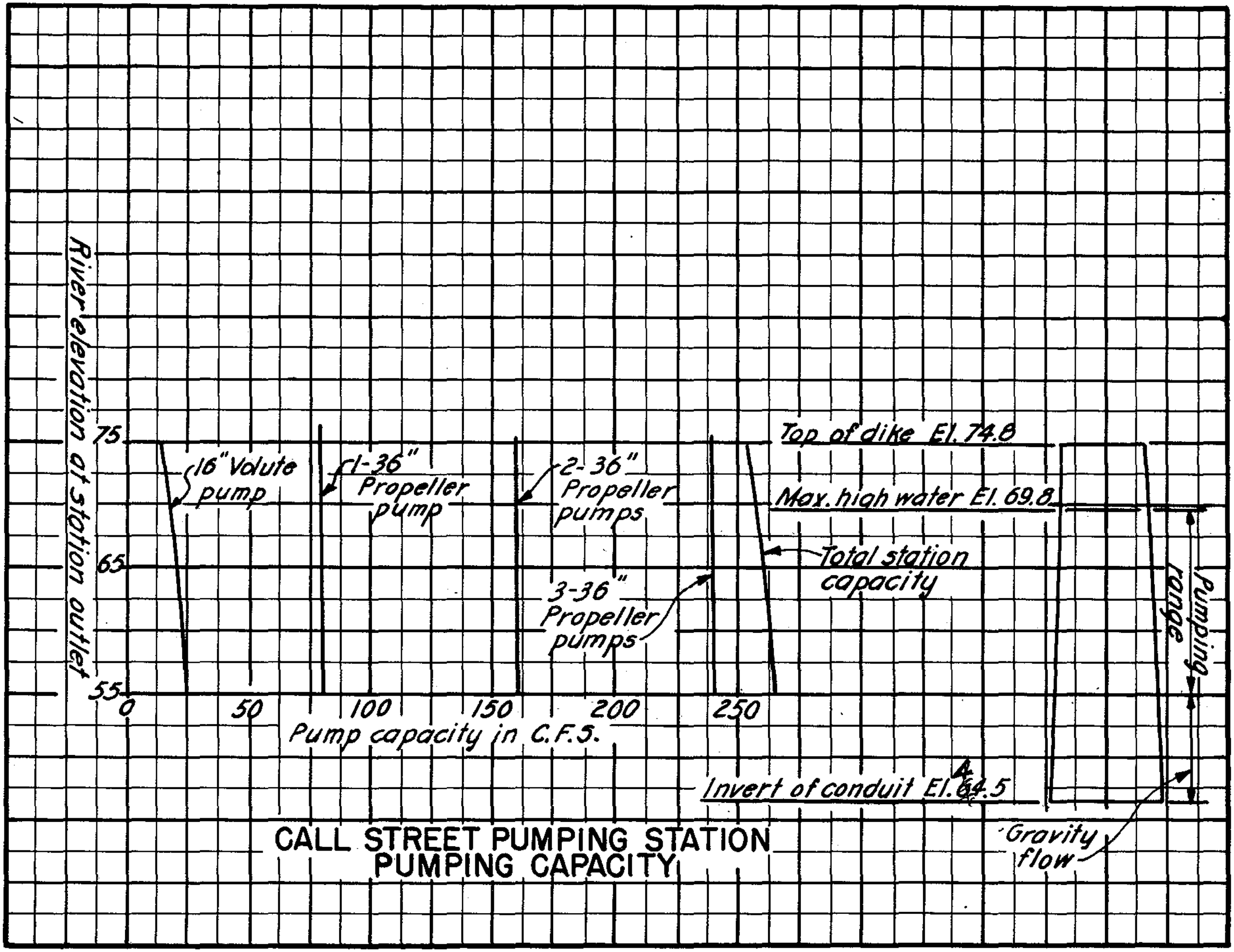
U.S. ENGINEER OFFICE, PROVIDENCE, R.I., MAY 1940

SUBMITTED: SENIOR ENGINEER, HEAD, DESIGN SECTION — APPROVAL RECOMMENDED: PRINCIPAL ENGINEER, CHIEF, F.C. ENGINEERING DIV. — APPROVED: LT. COL., CORPS OF ENGINEERS, DISTRICT ENGINEER

DESIGNED: ASSOC. ENGINEER — DRAWN: H.S. TRACED: J.A.C. CHECKED: — FISCAL YEAR 1940 — FILE NO. CT-4-2457

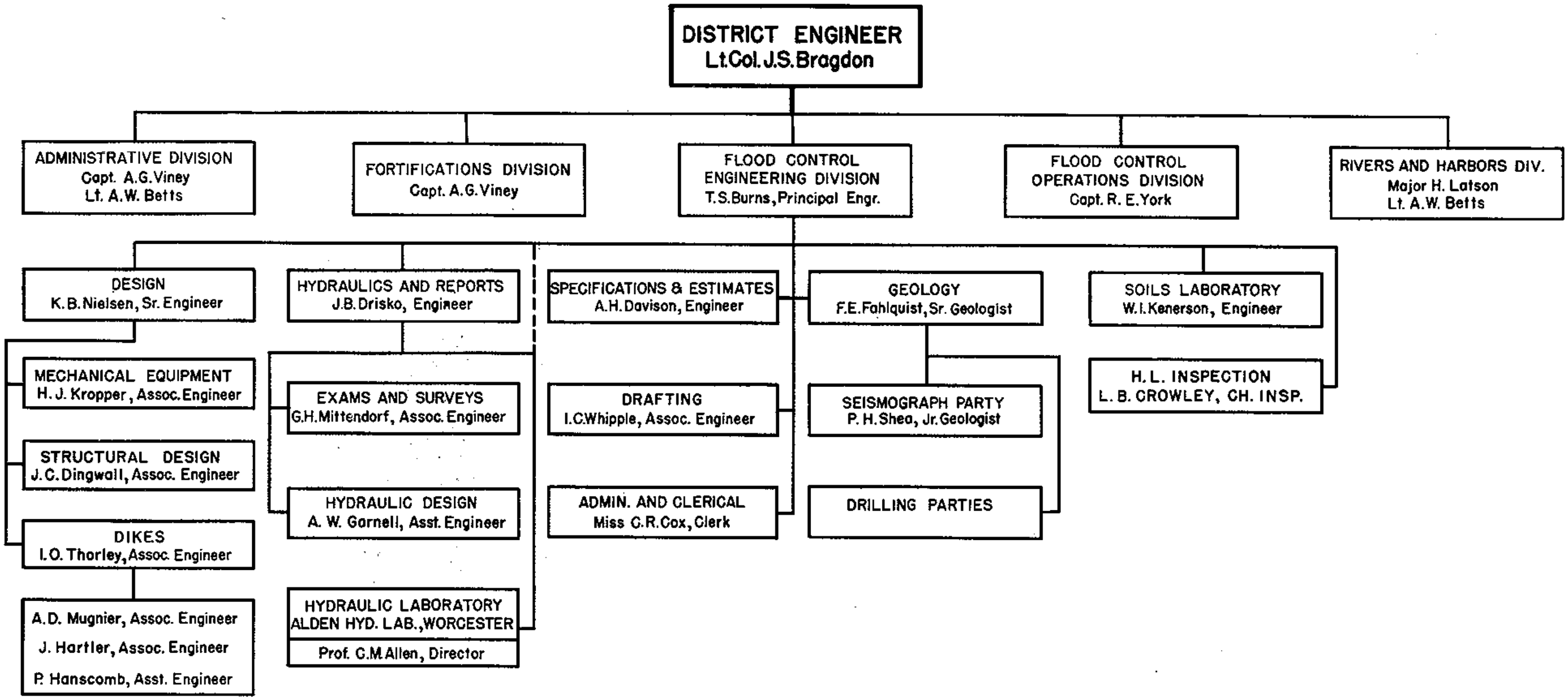
C5d

PLATE NO. 15



CALL STREET PUMPING STATION
PUMPING CAPACITY

PLATE NO. 16



ORGANIZATION CHART

FLOOD CONTROL

ENGINEERING DIVISION

U.S. ENGINEER OFFICE, PROVIDENCE, R.I.

MAY 1940

PLATE NO. 17